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ABSTRACT

This guide is intended for use by trainers presenting the Tools for Tomorrow program, a technical college program to train women for employment in 13 skilled trades. Discussed in the first two sections are these topics: the program's purposes, barriers encountered by women seeking to enter trades, and various aspects of implementing the Tools for Tomorrow program. Section 3 consists of 11 lesson plans on topics of general relevance to the skilled trades and 13 trade-specific lesson plans. Among the topics covered in the lesson plans are the following: the apprenticeship system, communicating on the job, hand tool use, job search skills, physical conditioning, print reading, and safety. The following trades are covered: carpentry, civil technology/surveying, electrical, ironwork, machine tool operation, operating engineers, painting and decorating, plumbing, sheet metal, steamfitting, trowel trades, welding, and woodworking/cabinetmaking. Included in each lesson plan are some or all of the following: background information; lists of competencies taught, required supplies, and resources; information on pertinent safety issues; and suggested activities. Section 4 contains supplementary information and overviews of resources on selected topics and a 38-item bibliography. Presented in section 5 are course outlines for each module. Concluding the guide are information updates on the Tools for Tomorrow program and its participants. (MN)

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Mary T. Knight, Coordinator
Tools for Tomorrow: Women in the Trades
Madison Area Technical College

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SECTION 1: INTRODUCTION

The Tools for Tomorrow: Women in the Trades Program is designed to help women obtain nontraditional employment or to enroll in nontraditional training programs. Employment in traditionally male occupations within construction and industry often leads to higher wages, improved job security, and more career advancement opportunities.

In the past, few females have been encouraged to enter nontraditional fields, particularly those that required training in skilled trades or technical specialties. As women have become more aware of the benefits inherent in nontraditional work and as sex equity legislation has provided increased opportunities in these fields, more women have become interested in employment in the trades. Many, however, are uncertain how to proceed. They often lack information about specific trades and are concerned about deficits in basic mechanical and math skills.

The Tools for Tomorrow: Women in the Trades Program is designed to address these issues. By providing career information, training in physical conditioning, technical information, and hands-on experience, the workshop informs women about opportunities in the trades and supports nontraditional career choices.

Women who make the decision to enter the trades come from a wide range of backgrounds. While some are highly educated professionals who have opted for a career change, others are less advantaged. Many have had difficulties in school and some have marginal academic skills. The following modules focus on information and skills that are likely to be new to most students.

Friends and family members may not support the decision to pursue a nontraditional career. Those closest to the woman may be uncomfortable with nontraditional choices and express concern about her math and mechanical aptitudes, her strength and agility, and her exposure to sexual harassment. These are often issues for the woman herself and must be addressed in the curriculum. Small class size and group activities encourage camaraderie within classes and mentoring by tradeswomen instructors. By the end of the workshop, students have met others who have made similar choices and can form alternate support systems.

Adult women are most motivated to learn when instruction draws on previous experience, produces a tangible result, and respects their adult status. Curriculum which links new information with a student's previous desire for mastery is particularly helpful. For example, a student who has been unsuccessful in unclogging a stopped-up tub will be motivated to learn about drainage mechanisms that help or hinder the process of cleaning the drain. The same information presented out of context will not receive the same attention. The modules that follow are designed to provoke the student's interest in this manner.

Performance anxiety is a common barrier to learning new skills. Hands-on experience helps to make this anxiety manageable. Demonstrations of skills (soldering copper joints, lifting awkward loads, or calculating slopes) followed by practice builds confidence and provides an opportunity for sensitive feedback. Most of the modules incorporate several activities designed to build specific psychomotor and cognitive skills.

Appropriate attitudes such as concern for safety, self-respect, and assertiveness in handling sexual harassment are best taught by modeling the correct behavior, by simulating problematic situations, and by role plays and exercises that encourage self-examination. Instructors model effective behavior throughout the course and provide confidence-building experiences.

Throughout the workshop, the focus is on imparting career information, building skills and confidence, and on encouraging whatever career decisions students make. While addressing obstacles realistically, activities are directed toward expansion of career options for women.

Section 2:
Program Implementation

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SECTION 2: PROGRAM IMPLEMENTATION

Organization and Operation

The program is administered by Madison Area Technical College through the Apprenticeship Department of the Agriscience, Apprenticeship, and Technical & Industrial Division. Developed as a pilot project in the fall of 1990, the program was designed to provide instruction and support services to assist women with entry into nontraditional postsecondary training and nontraditional employment in the skilled trades. Construction and industrial trades are covered, and material includes job duties, tool identification and usage, terminology, methods of apprenticeship or other job entry, minimum entry requirements, and often a related hands-on project.

Funding has been provided by the federal Carl Perkins Vocational and Applied Technology Education Act administered by the Wisconsin Board of Vocational, Technical and Adult Education as well as matching funds from MATC. A major outcome of the three-year pilot project was production of this Trainer's Guide for use in development of similar programs within other vocational districts in the state and throughout the country.

An essential element of the program has been the partnership with Employment Options, Inc., an agency with a successful history in recruiting and placing women for nontraditional jobs established as a community-based, nonprofit employment and training agency in 1975. As a subcontractor with MATC, Employment Options provides outreach, recruitment and orientation services; supportive services for securing child care and transportation assistance; and self-esteem and career exploration workshops prior to enrollment in training.

Another key feature of the program's operation is the involvement of the Advisory Committee composed of labor representatives, employers and tradeswomen. The committee's activities have included review of the curriculum, evaluation of training outcomes, job placement information, public relations, and fund-raising assistance. Several members have participated on the employer/apprenticeship coordinator panels providing information to participants on particular trades and on job opportunities.

Schedule

The Tools for Tomorrow training component is offered for 96 hours, meeting 12 hours a week, usually over an eight week period. The classes meet on 2 weekday evenings for 3 hours and on Saturdays for 6 hours. The Trainer's Guide covers over 100 hours of instruction and content can be modified as needed for a particular program depending on labor market information and local training opportunities. The organization for an eight-week session is shown below.

Calendar

	Monday	Wednesday	Saturday
Week 1	Program Introduction	Hand Tool Use	Sheet Metal
Week 2	Communicating On-the-Job	Steamfitting	Trowel Trades
Week 3	Ironworking	Safety	Welding
Week 4	Ergonomics	Exercise Physiology	Plumbing
Week 5	Tradeswomen Panel	Painting	Carpentry
Week 6	Job Search Skills	Print Reading	Machine Tool
Week 7	Employers and Apprentice-ship Coordinator Panel	Electrical	Electrical
Week 8	Operating Engineers	Evaluation	Woodworking

Facilities

The training is offered at Madison Area Technical College's Commercial Avenue Education Center and Truax campus. Use of the technical college's labs are essential for several of the shop classes: machine tool, sheet metal, welding, and woodworking. For other classes tools and supplies can be brought into the classroom. The program has purchased a variety of hand tools and other hand tools and power tools are provided by the technical college. Some instructors bring in their own tool sets for particular trades for class demonstration.

Instructors

A major strength of the program has been the commitment and skill of the instructors. These individuals have a sincere interest in having women enter the skilled trades and exhibit a high level of support, patience, encouragement in their work with participants inside and outside the classroom. Instructors were recruited from the MATC Apprenticeship Department, the Technical and Industrial Division, and the tradeswomen community. Tradeswomen involvement has been instrumental in helping students learn what to expect in nontraditional jobs and for providing realistic views about women's experiences in trades and technology. Team teaching is used for several of the classes to afford a better ratio of instructors to students for particular projects. These classes include: carpentry, electrical, machine tool, steamfitting, welding, and woodworking.

Outreach and Recruitment

The program uses a variety of outreach and recruitment activities to permit a growth of awareness by potential participants and to identify women with a strong interest in entering nontraditional training and employment. These activities include radio, television, and newspapers for public service announcement and periodic feature articles; neighborhood flyers and brochure distributions; secondary contacts with persons in service-providing organizations who have contact with likely participants; and direct contact in group and individual settings.

Orientation

After recruitment, applicants participate in a 3-hour orientation on nontraditional occupations, the Tools for Tomorrow Training program, and other training options. The orientation includes an overview of the advantages and disadvantages of nontraditional work, specific information and resources on the current labor market in targeted occupations, as well as information on apprenticeships, postsecondary nontraditional programs, and other training options. The content is described in the Lesson Plan section of this guide.

The orientation sessions are typically offered by the Employment Options nontraditional specialist once a month. The size of the group ranges from 6-12 women. Each applicant completes a general information form which is forwarded to the MATC coordinator. Orientations are provided primarily at Employment Options office which is on a major bus line and has free, on-street parking available. As appropriate, orientations are provided at offices of other service providers or at neighborhood centers.

At the orientation, the applicants without recent test scores are given the schedule for the math assessment offered at the MATC campus. A standardized academic test, either the ASSET or Tests for Adult Basic Education (TABE), is used. At the math assessment, applicants sign up for an interview with the coordinator.

Interview, Selection and Enrollment

The interview provides the applicant with an opportunity to clarify any questions she may have about the program and her entry into nontraditional training and employment. The coordinator has an opportunity to assess occupational interests, commitment to nontraditional employment, transferable skills. Areas of concern are addressed such as personal, family, health, child care and available community resources identified. Information on financial assistance for child care and transportation is provided and appropriate referrals are made.

The coordinator and Employment Options nontraditional specialist determine the selection approximately one month before the training session begins. Acceptance letters are then mailed requesting a call confirming enrollment. Those applicants who do not qualify are provided with information about other training resources and the steps needed to access them as well as the opportunity to continue attempts to qualify for the program if they wish, such as attainment of a high school equivalency diploma or improving low level math skills. MATC's Adult Basic Education Department provides free instruction for obtaining high school equivalency diploma or for improving math and other academic skills.

During training, the coordinator maintains regular contact with participants during the class sessions and outside of class time as needed. Assistance and advocacy are provided to deal with issues that arise during training is provided to ensure retention.

Job Search Assistance and Follow-up

Through individual and group job search assistance, participants learn the following: 1) methods

of organizing an effective job search - where to find job leads, networking, follow through and follow up; 2) effective written presentation - how to fill out job applications, write cover and thank you letters, and prepare resumes; 3) interview tips - proper dress, body language, and interview practice; and 4) job retention attitudes and behavior.

Participants are provided with apprenticeship application procedures and deadlines and other job opening information. They develop skills in identifying opportunities on their own to aid in their current job search and future job-seeking efforts.

After placement, the coordinator makes follow-up contacts with the participant. Difficulties may occur with worksite problems, personal and family pressures, or negative attitudes from coworkers. If problems are identified, assistance is provided to help the participant address the problem. The coordinator is available to meet with the participant and/or the employer to improve the situation.

Postsecondary Training Assistance

For participants deciding to enroll in postsecondary nontraditional programs, the coordinator provides assistance with clarification of career goals, arrangement of classroom visits, development of suitable educational plans, and selection of appropriate courses. Prior to entry, interested students may be paired with experienced students for classroom visits and support. Information and referral to other MATC and community support services is provided, such as financial aid, tutoring, study skills classes, and personal counseling. After the participant enters a nontraditional program, the coordinator maintains regular contact to assess programs and provide assistance, as needed, to ensure retention, graduation, and job placement.

Participant Evaluation

Participants are an importance source of feedback for evaluating the program. At the end of each class, participants complete an evaluation form indicating their overall rating of the class and their likes and dislikes. At the end of the session, participants complete an evaluation form for the overall program and participate in an informal discussion with the coordinator. These results have been used to modify training topics, lesson contents, and delivery.

At the end of the program year, a completion ceremony and potluck are held to acknowledge participants' accomplishments. Certificates are awarded to participants who successfully completed the program by attending 80% or more hours. Instructors and advisory committee members are invited to attend. Tools donated by local companies have been given as door prizes.

Program Enhancements

There are several additional components that would strengthen the existing program if additional funding was obtained. Prior to entry into the training program, a Career Challenge class based on the model developed by the New York State Occupational Education Equity Center would

address the internal barriers women face to entering and succeeding in nontraditional employment. The component would consist of a week-long intensive workshop based on a risk-taking model of goal setting and decision making. The activities are designed to identify individual strengths, build group trust, and improve self-concept. Use of this model has increased success and retention of women in subsequent nontraditional training. These barriers include feelings of isolation and lack of a women's support group in similar circumstances; lack of problem solving skills; fear of risk-taking, especially physical risks; inability to set short and long term goals; difficulty trusting others and working on a team; difficulty with taking credit for individual achievement; and lack of self-confidence and self-esteem.

Second, additional instruction in math, mechanical and abstract reasoning, and spatial relations would improve women's competitiveness for entry into nontraditional occupations and to improve their self-confidence in using these concepts on the job. Third, setting up a formal mentoring program including mentor recruitment and training, matching with mentees, follow-up, and evaluation. These personal connections with those experienced with success in the skilled trades can make the critical difference between ultimate success and failure in nontraditional occupations.

A fourth component would be to provide short-term, intensive occupational training in areas reflecting local labor market needs. A fifth area would be to provide technical assistance to employers to improve hiring and retention of women in nontraditional jobs.

Using the Trainer's Guide

Within this Trainer's Guide is a wealth of information about the Tools for Tomorrow program. The program has gradually evolved and is a success because of the input and work of many people. Instructors have been a primary force in its success.

Lesson plans developed for the Tools for Tomorrow program compose a large portion of this guide. These plans have worked for instructors and can serve as a guide to you as a new instructor. The lessons are not in the order of their delivery, but the order can be determined by using the Tools for Tomorrow class calendar. By reviewing previous lessons, you can see what content and experiences participants have been exposed to prior to your class. You will also be able to see what classes and content will follow the class you teach.

Each lesson plan contains background information, short term competencies, materials, safety issues, activities, and resources. All of this information is a guideline - no two lessons are ever exactly alike. As you prepare to teach a class, you may come up with activities, handouts, resources, or other issues that you would like to see added to the plan. Please feel free to share your ideas with the program coordinator.

It is very important to begin your first lesson by introducing yourself and sharing your work experience. Participants want to relate with you. By knowing about you and about your experience, they can begin to connect with you.

Early in each class, you are also encouraged to provide information about the trade or activity you are involved in. A good source of career information is the Wisconsin Career Information Service. Descriptions of each career, employment statistics, future job opportunities, pay, benefits, and other data is available and can be accessed in book form as well as by computer in all the libraries at MATC and most other technical colleges around the state.

In the Tools for Tomorrow program, participants encounter a wealth of information and experiences in nontraditional work. The lesson plans provide solely a framework for the instructor. Your presentation, input, leadership, and approachability have a very strong affect. Below are some things to keep in mind when teaching Tools for Tomorrow participants:

1. Women, typically, enjoy mutual learning. In fact, the opportunity to share the experience of learning together may help them over hurdles of self-consciousness and low self-esteem.

2. People tend to remember 90% of what they say and do. The more you can involve Tools for Tomorrow participants in learning by doing and sharing, the more they will learn.

3. What the best instructors bring to their students is their personal experience. Tools for Tomorrow participants are looking for your guidance and mentoring. They will respect you for your experience and your ability to share it. Be yourself!

4. Women tend to look for interactive and collaborative relationships with their instructors. They like to participate in the "mutual process of discovery" (Wolf, 1993).

5. Although an individual may not choose to pursue the trade-related skill you are teaching, she is accumulating experiences that contribute to her personal knowledge and empowerment.

As an instructor, you will have a great impact on the participants in the Tools for Tomorrow program. The information you share and experiences you facilitate are very important as is learner involvement. The climate for women in nontraditional occupations is improving. Certainly, as more women enter these fields, there will be increased accessibility to nontraditional employment in the future.

Section 3: Lesson Plans

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ORIENTATION
LESSON PLAN

Unit: Orientation Time: 3 hours

Background

Women attend the Tools for Tomorrow orientation in order to learn about the program and the support it offers to women pursuing nontraditional careers via apprenticeship, other nontraditional employment, or vocational technical training. Many of them have little or no background in nontraditional work.

Competencies

By the end of this unit, the student should be able to do the following:

1. Recognize main components of the Tools for Tomorrow Program.
2. Identify benefits (financial and personal) of pursuing nontraditional work as compared to traditional women's work.
3. Explain some of the entry methods and expectations of the apprenticeship system.
4. Identify nontraditional training options in the vocational technical system. Describe nontraditional occupations in construction and industrial trades.
5. Describe how affirmative action affects the hiring of women in construction trades.
6. Identify supportive services and community resources for childcare and transportation.
7. Identify supportive services and community resources available to Tools for Tomorrow participants for personal growth.
8. Identify some of the math skills required for nontraditional work and entry into the Tools for Tomorrow program.
9. Identify the Tools for Tomorrow application and acceptance process.

Supplies

Video: Trade Secrets
VCR and monitor

Application forms for Tools for Tomorrow
A Guide to Apprenticeship in Wisconsin, Wisconsin Department of Industry, Labor and Human Relations, Bureau of Apprenticeship Standards.
Handout: "Apprentice Application Information"
Handout: "Workshops, Classes, and Support Groups at Employment Options, Inc."
Handout: "Women in the Workforce Quiz"
Handout: "Tools for Tomorrow: Women in the Trades: Pre-Apprenticeship Program Calendar"
Handout: "Follow-up Study of 1992 Graduates"
Handout: Map of locations for MATC Truax and Commercial Avenue campuses
Pamphlet: "MATC Adult Basic Education"
Pamphlet: "Tools for Tomorrow: Women in the Trades"
Catalog: MATC Catalog, 1993-94

Activities

1. (20 minutes) Discuss roles of MATC and Employment Options, Inc. in the Tools for Tomorrow program referencing the Tools for Tomorrow pamphlet. Describe the hands-on exploration of the trades, funding, support, and networking. Hand-out the "Tools for Tomorrow: Pre-Apprenticeship Program Calendar".

2. (20 minutes) Handout "Women in the Workforce Quiz" and discuss the advantages to women who choose nontraditional work, such as tangible results, creativity, skills you never lose, mobility, transferability, union protection, and benefits ratio. Handout "MATC Follow-up Study of 1992 Graduates".

3. (45 minutes) Discuss how the apprenticeship system works: brief history, regulations, competition, and the selection process: hunting license vs. rank systems. Handout A Guide to Apprenticeship in Wisconsin. Review apprenticeship book, note variability of trades, pay scales, education components, and on the job training. Discuss non-union possibilities. Handout "Apprenticeship Application Information". Show the 23-minute video: Trade Secrets and discuss.

4. (15 minutes) Using the MATC catalog, discuss the nontraditional training options available through the vocational technical system.

5. (15 minutes) Discuss affirmative action and its effects on women in the construction trades: workplace safety, worker's compensation, the bidding process, and government funding for projects.

6. (10 minutes) Discuss supportive services and community resources available for childcare and transportation.

7. (10 minutes) Discuss supportive services and community resources available to Tools for Tomorrow participants on self-esteem, confidence building, job search techniques, and a tradeswomen support group, "Tools for Change". Handout "Workshops, Classes, and Support Groups at Employment Options, Inc."

8. (15 minutes) Discuss math skills required for nontraditional work and entry into the Tools for Tomorrow program by giving examples on the blackboard. Discuss the ASSET assessment. Handout the map of the MATC Commercial Avenue Education Centers, where the assessment is administered. Identify Adult Basic Education community resources for math instruction and remediation.

9. (15 minutes) Distribute the Tools for Tomorrow application and have each applicant complete the form. Each women is asked about any nontraditional experience, hobbies, or interests she may have, and these are noted in the comment area of the application.

10. (10 minutes) Review the Tools for Tomorrow application and acceptance process: orientation, assessment, interview, and decision on acceptance.

Resources

Employment Options, Inc. Workshops, Classes, and Support Groups at Employment Options, Inc., Madison, WI.
Madison Area Technical College (1993) MATC Catalog, 1993-94, Madison, WI.
Van Bramer, P. and Redsten, D. (1993) Follow-up Study of 1992 Graduates, Madison Area Technical College, Madison, WI.
Wisconsin Bureau of Apprenticeship Standards, U. S. Bureau of Apprenticeship and Training, and Madison Area Technical College (1992) Apprentice Application Information, Madison, WI.
Wisconsin Department of Industry, Labor and Human Relations, A Guide to Apprenticeship in Wisconsin, Madison, WI.
Women in the Workforce Quiz developed from information received from the National Commission on Working Women, Wisconsin's Women's Council, Wisconsin Bureau of Apprenticeship Standards.
Women Make Movies, Inc. (1989) Trade Secrets, New York.

PROGRAM INTRODUCTION
LESSON PLAN

Unit: Program Introduction Time: 3 hours

Background

During this unit, the coordinator will provide an overview of the program components. The coordinator will define her role and describe the student's responsibilities as an active participant in the program. As in subsequent units, students are encouraged to ask questions and make comments.

Competencies

By the end of this unit, the student should be able to do the following:

1. Describe the program goals and classroom procedures.

2. Identify available support services.

Supplies

Registration forms
Parking permit forms and stickers
Program Calendars
Instructor List
MATC Catalogs
Folder of apprenticeship materials:
"Apprenticeship Application Information"
Apprenticeship
Journey Into Tomorrow: Career Opportunities in the Mechanical Construction Trades
Apprentice Indenture Sample
"How to Become An Apprentice"
"Introduction to Apprenticeship"

Activities

1. (10 minutes) Review the program goals. Discuss the importance of full participation and group support. The coordinator discusses her role in the program's operation.

2. (15 minutes) Each student introduces herself and explains what brought her to the program and what her goals are for participation.

3. (15 minutes) Use a "name game" exercise for students to begin learning each other's *names.*

4. (15 minutes) Discuss classroom procedures - hours, absenteeism, punctuality, appropriate dress, and attendance sheets. Distribute and discuss the responsibility checklist. Explain the opportunities students have for evaluating the program and the importance of their input. At the end of each class an evaluation form is distributed. At the end of the training, there will be a group discussion on evaluating the entire program from the student's perspective and a program evaluation form will be completed.

5. (25 minutes) Review calendar and describe content of each class.

6. (10 minutes) Have students complete registration and parking permit forms. Distribute parking stickers. Students identifying an interest in car pooling can meet after class to make arrangements. Distribute class student list with address and phone information and have each student review for accuracy. Explain the importance of notifying the program office of any address and phone changes.

7. (5 minutes) Distribute folders with materials listed under Supplies section. Briefly describe the contents of each resource.

8. (10 minutes) Discuss the importance of physical conditioning for many nontraditional jobs and overall fitness. Give students information on the MATC Wellness Center and rates.

9. (10 minutes) Explain the Employability Plan that will be developed by each participant at the end of the training component. Describe the types of individual and group job seeking assistance the program will provide such as resume assistance, interview practice, job leads, and application procedures.

10. (10 minutes) Describe support activities such as individual advising sessions, Tools for Change tradeswomen support group, mentoring, follow-up sessions, newsletters, and the completion ceremony/potluck.

11. (10 minutes) Describe the support services available for students choosing to enroll in a nontraditional program at MATC and services available from Employment Options.

Resources

Madison Area Mechanical Contractors Association (1991) Journey Into Tomorrow: Career Opportunities in the Mechanical Construction Trades, Madison, WI.
Madison Area Technical College (1993) MATC Catalog, 1993-94, Madison, WI.
U. S. Department of Labor, Employment and Training Administration, Bureau of Apprenticeship and Training (1992) Apprenticeship, Washington, DC.
Wisconsin Bureau of Apprenticeship Standards, Department of Industry, Labor and Human

Relations and U. S. Bureau of Apprenticeship and Training, Department of Labor, Employment and Training Administration (1992) "Apprenticeship Application Information", Madison, WI.
Wisconsin Bureau of Apprenticeship Standards, Department of Industry, Labor and Human Relations, (1988) "Apprentice Indenture Sample", Madison, WI.
_____ (1991) "How to Become An Apprentice", Madison, WI.
_____ (1992) "Introduction to Apprenticeship", Madison, WI.
_____ (1992) "Madison Area Sheet Metal JAC Exhibit A Sample", Madison, WI.

APPRENTICESHIP SYSTEM
LESSON PLAN

Unit: Apprenticeship System Time: 1½ hours

Background

The goal of this unit is to familiarize students with apprenticeship training and the apprenticeship system both locally and nationally. Typically this material is integrated within several classes. During the orientation and the introduction class a general description of the apprenticeship system is covered. Many of the trade units provide apprenticeship information for their particular trade area. During the evaluation class, at the end of the training period, time is set aside for participant's individual questions for specific information on the trade selected.

Competencies

By the end of this unit, the student should be able to do the following:

1. Describe the apprenticeship training process including commonly used terms and concepts.

2. Describe the apprenticeship system and the roles of the Wisconsin Bureau of Apprenticeship Standards and the U.S. Bureau of Apprenticeship and Training as registration agencies, private industry, labor, and the Wisconsin Vocational, Technical and Adult Education system.

3. Describe the basic qualifications, selection procedures, and working conditions for one local apprenticeship program.

Supplies

Folder of apprenticeship materials:
"Apprenticeship Application Information"
Apprenticeship
Journey Into Tomorrow: Career Opportunities in the Mechanical Construction Trades
Apprentice Indenture Sample
"How to Become An Apprentice"
"Introduction to Apprenticeship"

Activities

1. (15 minutes) Provide a brief history of the apprenticeship system and the definition of apprenticeship. Define the common terms of apprenticeship: journeyworker, on-the-job

training, indenture, related instruction, paid-related, night school, joint apprenticeship committee.

2. (10 minutes) Explain the operation of an apprenticeship: selection, training, school, job rotation, rotation of work processes, advancement, wages, and apprentice review by sponsor. Review the rights of the apprentice and sponsor in the indenture, complaint procedures, and the process for resolving differences.

3. (10 minutes) Present an overview of apprenticeable occupations: construction, industrial, service, and other industries.

4. (10 minutes) Discuss local apprenticeship programs describing local registered programs, and giving information on local employers/committees.

5. (10 minutes) Provide information on local selection processes: construction (rank, intent to hire), industrial/manufacturing (restricted pool), and service and other industries.

6. (15 minutes) Discuss the preparation for an apprenticeship and common entry methods into apprenticeships for local programs: material handler position, pre-apprenticeship position, laborer, related work experience, high school and post-secondary classes.

7. (20 minutes) Answer questions from students on particular apprenticeship trades.

Resources

Madison Area Mechanical Contractors Association (1991) Journey Into Tomorrow: Career Opportunities in the Mechanical Construction Trades, Madison, WI.
Madison Area Technical College (1993) MATC Catalog, 1993-94, Madison, WI.
U. S. Department of Labor, Employment and Training Administration, Bureau of Apprenticeship and Training (1992) Apprenticeship, Washington, DC.
Wisconsin Bureau of Apprenticeship Standards, Department of Industry, Labor and Human Relations and U. S. Bureau of Apprenticeship and Training, Department of Labor, Employment and Training Administration (1992) "Apprenticeship Application Information", Madison, WI.
Wisconsin Bureau of Apprenticeship Standards, Department of Industry, Labor and Human Relations, (1988) "Apprentice Indenture Sample", Madison, WI.
_____ (1991) "How to Become An Apprentice", Madison, WI.
_____ (1992) "Introduction to Apprenticeship", Madison, WI.
_____ (1992) "Madison Area Sheet Metal JAC Exhibit A Sample", Madison, WI.

COMMUNICATING ON-THE-JOB
LESSON PLAN

Unit: Communicating on-the-Job Time: 6 hours

Background

This unit integrates basic knowledge of verbal and nonverbal communication. The emphasis is on improving communication skills to make interactions more effective and consequently, to allow students to fulfill their needs and state their rights. This unit will focus on skill development in areas including active listening, assertiveness training, conflict resolution, and sexual harassment. This unit is designed specifically for women in nontraditional careers. The unit will incorporate experiential learning strategies with lecture and discussion. Therefore, the instructor must create an environment that will allow and encourage participation.

Competencies

By the end of this unit, the student should be able to do the following:

1. Identify at least four nonverbal methods to develop rapport or trust with another individual.

2. Describe what is meant by "active listening" and demonstrate the concepts involved within given practical situations.

3. Distinguish among passive, aggressive, passive/aggressive, and assertive methods of communication.

4. Assess personal level of assertiveness in specific situations.

5. Define what is meant by "assertive expression" and "assertive listening" and practice combining the two in specific situations.

6. Identify at least two assertive strategies to deal with criticism and apply to practical situations.

7. Specifically discuss how anger might be handled in constructive ways.

8. Discuss and practice how conflict might be constructively resolved.

9. Discuss how a women, working in a nontraditional field area, might "talk with the guys", handle put-downs, and assertive aggression that could be experienced.

10. Identify specific behaviors that are indicative of sexual harassment.

11. Discuss the effects of sexual harassment on an individual.

12. State the legal definition of sexual harassment.

13. Identify preventive measures for sexual harassment and practice strategies given practical situations.

14. Identify and describe specific steps to take if an individual is being sexually harassed.

Supplies

Transparency: "Assertiveness Inventory"
Transparency: "Basic Human Rights"
Transparency: "Strategies for Responding to Criticism"
Transparency: "Constructive Ways to Handle Anger"
Transparency: "Sexual Harassment - Taking Control of the Situation"
Transparency: "Harassment Under Wisconsin's Fair Employment Law"
Transparency: "Who's Hurt and Who's Liable?"
Overhead

Activities

1. (25 minutes) Introduce topic - "listening without ears". Begin with group activity - Pacing (nonverbal). Process the interaction with students and continue relaying other nonverbal methods of creating rapport with another individual.

2. (45 minutes) Focus on active listening (verbal skills). Discuss the use of questions, paraphrase, feedback, summarization, perception of feelings. These basic skills relate to ensuring effective communication between the sender and receiver of the message. Following the lecture and discussion, students will be given verbal exercise in order to practice these basic skills. (The exercise will be read aloud while students will respond in writing.)

3. (25 minutes) Discuss the four basic styles of communication (passive, aggressive, passive/aggressive and assertive). Students will complete the Assertiveness Inventory and identify their own patterns of interactions.

4. (20 minutes) Discuss what is meant by assertive expression and assertive listening and have students practice combining the two in triads (student developed role plays).

5. (45 minutes) Introduce the topic of responding to criticism. Discuss the three main strategies for assertively responding to criticism (acknowledgement, clouding, and probing). Discuss "Strategies for Responding to Criticism". Instructor should give

specific examples of each strategy. Exercise: Students are given verbal statements while students write responses that exemplify acknowledgement, clouding, and probing. Review students' responses.

6. (15 minutes) Discuss special assertive techniques that include broken record, content-to-process shift, momentary delay, and time out and when these techniques are most appropriately used.

7. (15 minutes) Ask students how they feel when angry, how they cope with anger, etc. and write their responses on a chalkboard. Make the point that anger is a natural, healthy emotion that may be expressed in a number of ways. Identify constructive ways to handle anger and discuss "Constructive Ways to Handle Anger".

8. (10 minutes) Expressing anger may help in conflict resolution if done appropriately. Define conflict and describe specific steps that can be taken to resolve a conflict constructively.

9. (30 minutes) Instructor will have prepared scenarios that students may role play (scenarios are from the workplace) to apply the concepts discussed. Role plays will be processed and instructor will request students' feedback and comments.

10. (20 minutes) Ask students: "What does it mean to 'talk with the guys' in their field areas?" Ask students: "How does an individual deal with put-downs?" Identify possible strategies.

11. (10 minutes) Ask students: "What do you do when someone performs a behavior that is aggressive in nature?" (Give examples.) Process possible reactions to situations. (This topic will begin the topic transition to sexual harassment.)

12. (15 minutes) Discuss why it might be important to change one's behavior; i.e., becoming more assertive or less assertive. Discuss "Basic Human Rights" and discuss.

13. (20 minutes) Pass out index card and ask student to write down if they felt they have been sexually harassed. If yes, write down one example. Write down any effects that resulted due to the sexual harassment. Hand the cards in. Instructor will combine the information shared. Add any other behaviors or effects that may not be included on the students' cards and process.

14. (5 minutes) Give the legal definition of sexual harassment to students and discuss "Questionnaire on Sexual Harassment".

15. (45 minutes) Identify and discuss preventive measures to avoid sexual harassment that might be taken by an individual. Role play real-life situations developed by the instructor or students. Discuss "Sexual Harassment - Taking Control of the Situation".

16. (15 minutes) Identify specific steps that an individual might take if she is being sexually harassed. Discuss. (Final remarks.)

Resources

*Alberti & Emmons (1974) "Assertiveness Inventory" from Your Perfect Right, Impact Publishers, San Luis Obispo, CA.
*_____ (1990) "Constructive Ways to Handle Anger" from Your Perfect Right, Impact Publishers, San Luis Obispo, CA.
Center on Education and Work, (1992) Career Planning Curriculum, University of Wisconsin, Madison, WI.
*Gullickson, J., Sexual Harassment: Taking Control of the Situation, St. Paul, MN.
*Massachusetts Department of Education, "Questionnaire on Sexual Harassment" from Who's Hurt and Who's Liable. Sexual Harassment in Massachusetts Schools: A Curriculum Guide for School Personnel.
*McKay, Davis, & Fanning (1983) "Strategies for Responding to Criticism" from Messages: The Communications Book, New Harbinger Publications, Oakland, CA.
*Rawlings, E. (1977) "Basic Human Rights" from Psychotherapy for Women, Treatment Toward Equality, Charles Thomas Company.
Wisconsin Department of Industry, Labor and Human Relations, Equal Rights Division, "Harassment Under Wisconsin's Fair Labor Law" reprint, Madison, WI.

*copies of these materials are contained in the Career Planning Curriculum, University of Wisconsin, Madison, 1992.

EMPLOYER AND APPRENTICESHIP COORDINATOR PANEL
LESSON PLAN

Unit: Employer and Apprenticeship Coordinator Panel Time: 3 hours

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Background

The panel presentation and discussion give the student an opportunity to learn about employers' and joint apprenticeship committees' expectations. This panel typically includes employers and apprenticeship coordinators in construction and industrial trades. Ideally, these speakers will have employment opportunities available. Make arrangements with speakers well in advance and provide each with a list of topics to cover. For employers, topics would include the type of business, products and services, number of employees, types of jobs, qualifications, salary and benefits, application procedures, typical interview questions, and career advancement opportunities. Topics would be similar for apprenticeship representatives and would include job duties, qualifications, training, salary and benefits, application procedures, hiring system, advantages and disadvantages of the trade.

Competencies

By the end of this unit, the student should be able to do the following:

1. Describe employment opportunities, qualifications, and application procedures for one employer or apprenticeship trade represented.

2. Describe one employer's or apprenticeship coordinator's expectations of an employee or apprentice.

Supplies

List of speakers with name, job title, and company.

Activities

1. (10 minutes) Facilitator introduces each speaker providing, name, job title, and employer. Explain that a discussion period will follow the presentations and review the topics that will be covered. Ask participants to write down their questions during the presentations.

2. (75 minutes) Each speaker provides a presentation of approximately 15 minutes, covering the topics listed above.

3. (95 minutes) After the speakers' presentations, students ask questions. Facilitate discussion as needed. Depending on the amount of discussion and interaction, the class may not last for three hours. Often students wish to speak individually with the speakers.

Resources

Employers in construction and industrial trades, and apprenticeship coordinators.

HAND TOOL USE
LESSON PLAN

Unit: Hand Tool Use — Time: 3 hours

Background

The purpose of this session is to provide an introduction to the use of hand tools and have each student practice using hand tools safely and effectively.

Competencies

By the end of this unit, the student should be able to do the following:

1. Identify the name and function of a variety of hand tools.
2. Describe the safe use of several hand tools.
3. Describe how to safely carry lumber/plywood.

Supplies

10 - 16 oz. hammers (mixture of straight and curve claw)
2 - 20 oz. hammers
1 - 24 oz. hammer
20 - 10' 2x4s
20# - 16d nails
5# - 8d nails
3 crosscut saws
4 flat bars
4 cat's paws
4 nail sets
3 - ½" 4x8 sheets of plywood
3 coping saws
2 try squares
2 chalk lines
2 - 10' base trim
3 - ½" 4x8 sheets of drywall
3 keyhole saws
2 compasses
4 chisels (½" and 1")

5 - 25' tape measures
1 - 8' 2x6
1 - 8' 2x12
Carpenter's tool pouch with tools

Safety Issues

- Wear necessary safety equipment.
- Consider other people's safety.
- Body position is crucial (body is not "in line" with tool motion).
- How to hold tools.
- Lifting techniques (stress leg use rather than back use).

Activities

1. (15 minutes) Discuss safety measures concerning hand tool use.

2. (135 minutes) At stations set up prior to the class, demonstrate techniques used for the following activities. Have students rotate from station to station trying out each exercise listed.
   a. Sink 16d nails into 2x lumber without bending, try to use as few hits as possible and still maintain accuracy. Use a variety of nails and hammers.
   b. Nail mock 2x4 wall together using face nail and toe nail technique (understand concept of studs 16 O.C.).
   c. Pry out nails using cats paw, flat bar, hammer (understand leverage concept with technique).
   d. Set nails with nail set.
   e. Carry 4x8 sheet of plywood with and without partner.
   f. Using coping saw, cut an inside miter corner in base board.
   g. Use crosscut saw on 2x material (understand different characteristics of crosscut and ripping handsaw).
   h. Cut drywall using utility knife and drywall square and rasp, cut circle out of drywall using keyhole saw and again using knife and hammer.
   i. Chisel out a notch in 2x material.
   j. Use tape measure to measure lumber (understand concept of nominal/actual size of lumber, understand tape divisions).
   k. Carry a stack of 2x material on shoulder and on side of body.

3. (30 minutes) Discussion to include: tool pouch/tool box contents and use of tools; buying tools (brand names of tools and stores in town); cold weather gear; where math comes into carpentry (geometry, converting decimals to fractions); apprenticeship procedure in Madison (how to get in and working conditions). Leave time for questions and answers.

Resources

Kreutz, E., (1991) Chicago Women in the Trades Curriculum Guide for Pre-Apprenticeship Training, Chicago, IL.
McCormick, D., (1987) Housemending, E. D. Dutton, New York, NY.
Wagner, W., (1987) Modern Carpentry, Good Heart Willcox Co., Inc., Chicago, IL.

JOB SEARCH SKILLS
LESSON PLAN

Unit: Job Search Skills Time: 3 hours

Background

This unit gives students in the Tools for Tomorrow program an introduction to the various facets of the job search process. It stresses the importance of documentation and presentation to potential employers.

Competencies

By the end of this unit, the student should be able to do the following:

1. Describe the contents and uses of a job hunting folder.
2. Describe the significance of good references.
3. Describe the importance of completing a job application accurately and neatly.
4. Describe the information contained in a resume.
5. Explain the important parts of a letter of application.
6. Identify some positive behaviors in an interview session.
7. Describe how a rating system is used in an interview session for apprenticeships.
8. Describe the set up and use of a job lead file.

Supplies

Handout: "Job Hunting Folder Checklist"
Handout: "The Resume"
Handout: "Resume Work Sheet"
Handout: "Resume Writing Action Words"
Handout: "Sample Resumes"
Handout: "Format of a Sample Letter to Employer"
Handout: "Possible Questions to Ask In an Interview"
Handout: "Thank you Letter"
Handout: "Job Lead File"

Activities

1. (20 minutes) Describe the importance of the job hunting folder and its contents. Handout "Job Hunting Folder Checklist" and manila folders to each participant. Discuss the meaning and importance of each category in the checklist as well as the uses of the job hunting folder.

2. (15 minutes) Discuss the importance of references and why certain people are better references than others.

3. (15 minutes) Discuss a common application for employment. Emphasize the importance of neatness and accuracy of information when filling out an application.

4. (30 minutes) Emphasize the importance of a resume as a marketing tool. Handout: "The Resume". Discuss the parts of a resume. Handout "The Resume Work Sheet". Have students fill in personal information. Discuss the emphasis on employment history, training, qualifications, and references. Talk about the importance of action words in creating a resume. Handout: "Resume Writing Action Words".

5. (30 minutes) Describe the different types of resumes: chronological, functional, or a combination of the two. Handout: "Sample Resumes". Discuss the value of different resume types. Inform students of resume writing and preparation services available through the program. Encourage students to have three readers of any material sent to employers.

6. (20 minutes) Discuss the importance of a letter of application. Handout "Format of a Sample Letter to Employer". Explain the important parts of a letter of application.

7. (20 minutes) Discuss appropriate interviewing attitudes and behaviors as well as standard questions that are asked in an interview. Handout "Possible Questions to Ask in an Interview". Discuss the appropriateness of these questions.

8. (15 minutes) Discuss A Guide for the Interview Session and rating system sometimes used in interviews for apprenticeship programs.

9. (15 minutes) Handout "Job Lead File" forms and discuss the use of them when pursuing a job.

Resources

Center on Education and Work, (1992) Career Planning Curriculum for Adults, University of Wisconsin, Madison, WI.
Clements, K., (1993) "Job Hunting Folder Checklist", Tools for Tomorrow: Women in the Trades Trainer's Guide, Madison Area Technical College, Madison, WI.
_____ (1993) "The Resume", Tools for Tomorrow: Women in the Trades Trainer's Guide,

Madison Area Technical College, Madison, WI.
_____ (1993) "Resume Work Sheet", Tools for Tomorrow: Women in the Trades Trainer's Guide, Madison Area Technical College, Madison, WI.
_____ (1993) "Resume Writing Action Words", Tools for Tomorrow: Women in the Trades Trainer's Guide, Madison Area Technical College Madison, WI.
_____ (1993) "Sample Resumes", Tools for Tomorrow: Women in the Trades Trainer's Guide, Madison Area Technical College, Madison, WI.
_____ (1993) "Format of a Sample Letter to Employer", Tools for Tomorrow: Women in the Trades Trainer's Guide, Madison Area Technical College, Madison, WI.
_____ (1993) "Possible Questions to Ask In an Interview", Tools for Tomorrow: Women in the Trades Trainer's Guide, Madison Area Technical College, Madison, WI.
_____ (1993) "Thank you Letter", Tools for Tomorrow: Women in the Trades Trainer's Guide, Madison Area Technical College, Madison, WI.
_____ (1993) "Job Lead File", Tools for Tomorrow: Women in the Trades Trainer's Guide, Madison Area Technical College, Madison, WI.
U. S. Department of Labor - Bureau of Apprenticeship and Training, A Guide for the Interview Session, Pipe Trades Apprenticeship Form #3, Washington, DC.
Wisconsin Career Information Service, (1992) Going to Work, Wisconsin Career Information System, Madison, WI.

PHYSICAL CONDITIONING
LESSON PLAN

Unit 1: Ergonomics Time: 3 hours

Background

Proper selection of hand tools and correct usage prevents many injuries. Students often own, inherit, or buy tools that do not meet safety standards. Encourage students to evaluate the risks of using these tools and to buy replacements as soon as possible.

Competencies

By the end of this unit, the student should be able to do the following:

1. Define ergonomics.
2. Explain how poor tool choice and incorrect usage of tools contributes to injury.
3. Select tools that minimize static muscle loading, pressure on joints, vibration, and pinching.
4. Demonstrate the correct way to use various hand and power tools.
5. Describe how cumulative trauma disorders and awkward lifting injuries occur.
6. Demonstrate the relationship between base of support and center of gravity in standing postures.
7. Demonstrate proper methods of manual lifting and handling.
8. Explain why safety equipment should be used.

Supplies

Handout: "Physical Requirements of the Trades"
Transparency: "Cumulative Trauma Disorders"
Transparency: "Ladder Safety"
Transparency: "Renovations"
Overhead
Several sizes of ladders
25-50 lb. bags of cement or sand

Plywood
Drywall
Supplies for demonstration: Hand and power tools such as:
Hammers - various sizes
Pliers - regular and locking
Wire cutters - regular and 3"
Saw or pliers with notched finger handle
Screwdrivers - various sizes and handles
Circular saws - various sizes
Router
Sander
Power drills - various sizes
Gloves - cotton, rubber, heat-resistent

Safety Issues

- Remind students of safety procedures for handling power and hand tools.

Activities

1. (30 minutes) Define ergonomics and explain how proper tool design can minimize injuries. Illustrate your presentation with examples of good and bad tool design.

2. (45 minutes) Demonstrate the correct way to use hand tools, power tools, and tools with torque. Have students practice with hand tools only.

3. (20 minutes) Using transparencies, describe cumulative trauma disorders.

4. (20 minutes) Examine the biomechanics of posture. Demonstrate the relationship between the base of support and center of gravity in standing postures by doing partner exercises.

5. (45 minutes) Practice proper methods of manual lifting and handling through practice with ladders, shifting loads, heavy weights, and large, heavy sheets in five stations:

   Station #1: the correct way to move a 50+ lb. wooden box to table height and back to the floor (using weight plates added in 10 lb. increments);

   Station #2: the correct way to carry, set up, climb, and take down a standard ladder;

   Station #3: the correct way to carry, set up, climb, and take down an extension ladder;

   Station #4: the correct way to move large, heavy materials such as plywood, alone and with a partner;

Station #5: the correct way to move a wheelbarrow filled with bricks or bags of cement. Have each student demonstrate safe handling of materials at each station.

6. (20 minutes) Discuss general safety issues: proper attire, safety shoes, hard hats, goggles, respirators and masks, chemical gloves, etc. Discuss safety questions to ask yourself. Allow time for questions and discussion.

Resources

O'Connor, A., (1993) "Physical Requirements of the Trades", Tools for Tomorrow: Women in the Trades Trainer's Guide, Madison Area Technical College, Madison, WI.
Ladder Safety from Tradeswoman Magazine (Vol. 2, No. 1, Spring 1982), San Francisco, CA.
Cumulative Trauma Disorders.
Shepard, A., (1988) Renovations: Apprenticeship, Rentin Technical Vocational Institute, Rentin, WA.

PHYSICAL CONDITIONING
LESSON PLAN

Unit 2: Exercise Physiology — Time: 3 hours

Background

Students are often unaware of the physical demands of various trades. To prevent injury, students must acquire fitness levels appropriate to a specific type of work and understand the correct way to move and handle heavy or awkward equipment.

Competencies

By the end of this unit, the student should be able to do the following:

1. Describe physical demands characteristic of various trades.
2. Explain the need for physical fitness.
3. Identify the main components of a complete exercise program.
4. Demonstrate the proper use of basic weight training equipment on a Universal set.
5. Demonstrate correct movements for exercises suggested in the home conditioning program.

Supplies

Universal Gym
Olympic bar and bench
Dumbbells of various weights: 5#, 10#, 15#, 20#
Exercise mats

Safety Issues

- Although you will be demonstrating correct methods of lifting, moving equipment, and exercising, some students forget the methods when asked to perform in front of others. Remind them to think through the technique before acting.

Activities

1. (30 minutes) Discuss physical requirements of the various trades and the need for physical fitness. Mention issues related to pregnancy and other special concerns of women. Distribute handout: "Physical Requirements of the Trades".

2. (30 minutes) Review the types of injuries most likely to occur on the job: Cumulative Trauma Disorders and those caused by improper posture and incorrect methods of lifting.

3. (30 minutes) Using "Exercise Prescription" discuss the main components of an exercise program.

4. (60 minutes) Demonstrate proper weight training techniques on a Universal Gym set, Olympic bench set, and with dumbbells. Have students practice the proper use of the equipment. Handout "Weight Training Introduction".

5. (30 minutes) Demonstrate the correct movements for exercises in the home conditioning program. Have students attempt each exercise and correct their movements as needed.

Resources

A.C.S.M. Fitness Book, (1992) Leisure Press, Champaign, IL.
American Red Cross (for booklets on the prevention of back injuries and reference materials).
Anderson, B., (1980) Stretching, Shelter Publications, Bolinas, CA.
Back Exercises for a Healthy Back, (1988) Krames Communications, Daly City, CA.
Fahey and Hutchinson, (1992) Weight Training for Women, Mayfield Publishing Co. Mountain View, CA.
Pearl, B., (1986) Getting Stronger, Shelter Publications, Bolinas, CA.
Rippe and Ward, (1989), Rockport Walking Program, Prentice Hall Press, New York, NY.
Shepard, A. Renovations: Apprenticeship, Rentin Technical Vocational Institute, Rentin, WA.
Thompson, C. W., (1989) Manual of Structural Kinesiology, C. V. Mosby Co., St. Louis, MO.
Tobins, M., and Sullivan, J. P., (1992) Complete Stretching, Alfred A. Knopf, New York, NY.
Universal Gym, MATC, 2125 Commercial Avenue, Room 704, Madison, WI.
Yessis, M., (1992) Kinesiology of Exercise, Masters Press, Indianapolis, IN.

PRINT READING
LESSON PLAN

Unit: Print Reading Basics — Time: 3 hours

Background

Most work in the trades requires the ability to read blueprints. This unit focuses on symbols, abbreviations, and sections commonly used in the trades. Measurement conversion is included; however, mathematical concepts can be difficult for some students. Group work allows more able students to act as peer tutors for those who are math phobic or those with more limited math skills. Instructor should be alert for those students who foster dependency in others. These students should be grouped with more independent learners.

Competencies

By the end of this unit, the student should be able to do the following:

1. Translate standard symbols and abbreviations used on blueprints of buildings or bridges.
2. Determine the type of section (view) depicted on a blueprint.
3. Read elevations from a blueprint.

Supplies

House plans
Bridge plans
Handout: "Definitions and Symbols"
Quiz: "Print Reading"
Plastic engineer and architect scales
Triangles
Pencils

Activities

1. (30 minutes) Introduce students to the importance of blueprint reading in the construction trades and the interaction of prints, specifications, and codes. Describe how a design community works: the roles of the architect, contractor, foremen, and workers. Show an example of a code book.

2. (50 minutes) Distribute sets of house prints. Explain the difference between different sections (views). Indicate the meaning of abbreviations and symbols (outlets, switches, different window types, materials, rises and run, etc.). Have students practice reading information from other prints in the set.

3. (20 minutes) Show students architect and engineer scales and explain the different conventions used in each profession.

4. (50 minutes) Distribute the bridge plans. Explain different sections and discuss how elevation is determined. Indicate the meaning of abbreviations and symbols used on the plan. Have students practice reading information from the second set of blueprints.

5. (30 minutes) Give the quiz on prints and specifications. Go over the correct answers before students leave class.

Resources

Beakley, G. C. & Chilton, E. G., (1973) Introduction to Engineering Design and Graphics, New York: Macmillan.
Cannestra, B., (1991) "Print Reading", Tools for Tomorrow: Women in the Trades Trainer's Guide, Madison Area Technical College, Madison, WI.
"Definitions and Symbols", from Building Trades Printreading - Part 2, (1989) American Technical Publishers Company, Homewood, IL.
Sets of house prints and bridge prints (instructor's collection).

SAFETY
LESSON PLAN

Unit: Introduction to Safety Time: 3 hours

Background

This unit provides basic knowledge about industrial safety, safety awareness, and personal protective equipment. The lesson plan, when implemented, will provide instructor/student interaction in the form of student questions and several discussion periods.

Competencies

By the end of this unit, the student should be able to do the following:

1. Identify behaviors and attitudes which may interfere with a person's safety awareness.
2. Identify appropriate personal protective equipment for hazards to eye, face, skin, hearing, and breathing.
3. Discuss OSHA and the "right to know" or Hazard Communication Rule.
4. Explain what an MSDS is and the information it can provide.
5. Describe safety factors to be considered before using a piece of equipment.
6. Describe safety considerations for work areas.
7. Discuss how a worker's attitude and training affects personal, equipment, and shop safety.

Supplies

Handout: "Material Safety Data Sheet" (any common chemical)
Transparency: "Material Safety Data Sheet" (same as handout)
Video: Milwaukee Tool Safety
VCR and monitor
Overhead

Activities

1. (15 minutes) Present examples of industrial accidents/automobile accidents in which attitude or behavior was the cause. Explain how anger, lack of sleep, medication, and stress interfere with safety awareness. Ask for student examples. Stress the need for an awareness of the potential of the situation.

2. (60 minutes) Discuss personal protective equipment (PPE) in relation to particular hazards. Include eye, face, skin, hearing, and breathing protection. Include impact, abrasion, particulate matter, chemical, vapor, fume, electrical, and U.V. hazards. Discuss proper clothing and footgear.

3. (15 minutes) Briefly discuss OSHA and what the Hazard Communication Rule or "right to know" means.

4. (15 minutes) Explain what an MSDS is and who provides it. Supply each student with a copy of an MSDS (or use overhead transparency) and interpret the information on the MSDS as students follow.

5. (20 minutes) Discuss equipment safety. Stress the importance of knowing how to properly use the equipment. Discuss operator's manuals.

6. (20 minutes) Discuss work environment safety and the importance of good housekeeping. Discuss work area layout in relation to safety.

7. (35 minutes) Show Milwaukee Tool Safety video (examples of a worker's lack of safety training, proper tool use, personal and shop safety). Discussion and student questions.

Resources

MSDS Pocket Dictionary (1987) Genium Publishing Corp., Schenectady, NY.
Material Safety Data Sheet (MSDS).
Milwaukee Tool Company, (1985) Milwaukee Tool Safety, Milwaukee, WI.
OSHA Occupational Safety and Health Standards, Part 1910, Subpart I - Personal Protective Equipment, 1910.132 - 1910.137; Part 1910, Subpart G - Occupational Health and Environmental Control, 1910.95, Occupational Noise Exposure.

TRADESWOMEN PANEL
LESSON PLAN

Unit: Tradeswomen Panel Time: 3 hours

Background

The panel presentation and discussion gives the student an opportunity to learn firsthand about women's experience in a variety of trades. Tradeswomen panel members should be selected to cover construction, industrial, and technical areas, usually 5 speakers with a facilitator. Topics should be given to the speaker when she is scheduled for the panel and include how she became interested in the trade, job duties and working conditions, salary and benefits, training and/or experience required, career advancement opportunities, responses of family and friends to her career choice, and her experiences with working in a predominantly male environment.

Competencies

By the end of this unit, the student should be able to do the following:

1. Describe the duties of one trade area presented.

2. Describe situations and issues affecting a woman employed in a nontraditional occupation.

Supplies

List of speakers with name, job title, and company.

Activities

1. (10 minutes) Facilitator introduces each speaker providing name, trade and company. Review the topics that will be covered and explain that a discussion period will follow the presentations. Ask participants to write down their questions during the presentations.

2. (75 minutes) Each tradeswoman provides a presentation of approximately 15 minutes, covering the topics listed above.

3. (95 minutes) After the speakers' presentations, students ask their questions. Facilitate discussion as needed. Depending on the amount of discussion and interaction, the class may last the full three hours and can be ended when appropriate. Often students wish to speak individually with tradeswomen in their area of interest.

Resources

Tradeswomen panel members from five trades in areas of construction, industrial, and technology including facilitator.

CARPENTRY
LESSON PLAN

Unit: Basic Carpentry Time: 6 hours

Background

In this unit, a short section of prefabricated wall is erected on a preexisting segment of subfloor. Instructors should ensure that students participate in all phases of construction and that they follow safety procedures. Students who have troubles in nailing, operating equipment, etc. may need coaching by the instructor.

Competencies

By the end of this unit, the student should be able to do the following:

1. Describe career opportunities in carpentry in terms of demand, required training and experience, and wage.

2. Describe related job opportunities (eg. millwright, cabinet maker, resilient floor layer).

3. Demonstrate the safe use of a circular saw and band saw.

4. Explain the following terms: partition, studs, door header, window header, bottom plate, load-bearing, non-load bearing, top plate, cripple studs, trimmer studs, corner assemblies, and diagonal brace.

5. Measure and lay out components for a prefabricated wall.

6. Prefabricate a section of load-bearing wall which includes a window opening, a door opening, and inside corner assembly.

7. Erect a prefabricated section of wall on a section of subfloor and add drywall.

Supplies

Handout: "Madison Area Carpenters Joint Apprenticeship Committee Occupational Description"
Transparency: Wall section
Overhead
10 claw hammers
4 try squares
25' steel tapes (1 for every 2 students)

4 framing squares
35 14' 2x4's
2 14' 1x8
4 sheets ½" sheet rock
3# 1¼" drywall screws
1 sheet 3/4 plywood
3# 16penny sinkers nails
1# 16penny common nails
5 gal. bucket joint compound
Pencils for each student
1 pkg. "bimetal" sawzall blades - 6" middle range teeth
2 7¼" saw blades - carbide (combination)
1 ½" spade bits
1 3/4" spade bits
1 red chalk (small bottle)
Circular saw
Band saw

Safety Issues

- Begin the prefabrication lesson with the safety lecture.
- Remind students to wear safety glasses when operating power tools.
- Check students to be certain that attire is appropriate and that long hair is tied back; remind them that dangling jewelry, scarves, loose sleeves, etc. are dangerous. Boots should be worn, not tennis shoes.
- Watch for students who have a tendency to lean their chests into the path of drills and power saw blades.
- Review the correct way to move long boards and heavy lumber.
- Show how to position lumber on sawhorses for cutting.

Activities

1. (30 minutes) Briefly discuss the demand for carpenters, the training and experience required to become a carpenter, and the wage scale in Wisconsin. Mention related job opportunities (eg. millwright, cabinet maker, resilient floor layer, etc.). Hand out Madison Area Carpenter's Joint Apprenticeship Committee's Occupational Description. Allow time for questions.

2. (45 minutes) Demonstrate the correct way to use power tools and hammers. Discuss power tool safety, particularly with a circular and band saw. Divide the students into pairs and have them devise strategies to use when others try to convince them to use unsafe practices while operating power equipment.

3. (30 minutes) Using an overhead transparency of a wall section, explain the difference between load- and non-load bearing walls and specific structural parts (studs, trimmers,

headers, plates, braces, cripple studs, and corner assemblies).

4. (150 minutes) Demonstrate the correct way to measure components, the correct order in which to assemble the structure, and the correct nailing procedure. Divide the class into two groups. Using the print of the wall section that was provided, have students prefabricate the wall.

5. (105 minutes) Erect the prefabricated wall section on the subfloor. Add drywall. Demonstrate the correct techniques before allowing the students to begin. Have students clean up the area before they leave.

Resources

Lux, D. G., Ray, W. E., Blankenbaker, E. K., & Umstattd, W., (1982) World of Construction: Laboratory Manual - Part 2, Westerville, OH: Glencoe/McGraw-Hill. pp. 69-73.
Madison Area Carpenters Joint Apprenticeship Committee, (1992) "Occupational Description", Madison, WI.
Madison Area Carpenters Joint Apprenticeship Committee, (1992) "Summary of Procedure for Application, Qualification, and Selection of the Carpenter and Millwright Apprentices", Madison, WI.
Madison Area Technical College Apprenticeship Division, Apprenticeship Handbook.
Wisconsin Department of Industry, Labor, and Human Relations, Wisconsin Administrative Codes: Uniform Dwelling.

CIVIL TECHNOLOGY/SURVEYING
LESSON PLAN

Unit: Surveying Basics Time: 6 hours

Background

Many students have problems reading vernier scales and visualizing spatial relationships. Worksheets with examples of vernier scale readings are helpful. Drawing an overhead view of the road and the house perimeter will help the instructor relate actual measurements to the completed project.

Competencies

By the end of this unit, the student should be able to do the following:

1. Describe career opportunities in civil technology/surveying in terms of demand, required training and experience, and wage.

2. Describe related job opportunities.

3. Read vernier scales.

4. Stake out a curve in a road given a blueprint.

5. Stake out the perimeter of a building to be constructed given a blueprint.

Supplies

Handout: "Civil Technology/Surveying Occupational Description"
Worksheet: "Vernier Scales"
Video. Civil Engineering
Video: Land Surveying
VCR and monitor
3 100' fiberglass tapes
3 levels
3 Philadelphia rods
Range poles (for transits)
Stakes
100' chain
Simple transits with bullseye levels

Blueprint of a road curve
Blueprint of a house to be constructed

Safety Issues

- Remind students of the safety hazard presented by traffic as they walk to sites or work near streets.
- Remind them to be alert for stakes and lines of other groups.

Activities

1. (45 minutes) Present the video on civil engineering. Discuss the different types of work in building construction, sanitary engineering, and highway construction. Distribute Civil Technology/Surveying Occupational Description. Allow time for discussion.

2. (60 minutes) Present the video on land surveying. Review key points: technique, locating landmarks, etc. Allow time for questions.

3. (60 minutes) Explain how to read vernier scales. Separating students into groups of three or four, have them practice by reading the verniers given on the worksheet followed by actual readings on the transit.

4. (15 minutes) Assign two transit exercises: one to stake out a road curve and another to stake out a building perimeter. Explain where the sites are located and how to proceed. Separate the students into three groups.

5. (80 minutes) Assist students as they stake out the road curve specified in the blueprint.

6. (80 minutes) Assist students as they stake out the perimeter of the building specified in the blueprint.

7. (20 minutes) Review the two assignments and ask for questions. Have students return equipment to the proper location.

Resources

American Society of Civil Engineers, (1986) Civil Engineering, New York, NY.
Pennsylvania Society of Land Surveyors, (1986) Land Surveying, Allenton, PA.
Madison Area Technical College Apprenticeship Division, Apprenticeship Handbook.

ELECTRICAL
LESSON PLAN

Unit 1: Introduction to Electrical Work — Time: 3 hours

Background

In this unit, students will recognize various wiring systems, construct a working model of a wiring system, and learn techniques for installing wiring in a residential setting.

Competencies

By the end of this unit, the student should be able to do the following:

1. Describe career opportunities and job duties of an electrician in the construction and industrial fields, and related career opportunities that could be pursued after becoming an electrician.
2. Describe the requirements and goals of electrical apprenticeship programs.
3. Identify common tools used by electricians.
4. Demonstrate bending conduit to a 90° angle using a conduit bender.
5. Recognize basic electrical symbols used on blueprints.
6. Describe the functions of a switchbox.
7. Identify the parts of a wiring system: a switchbox, lighting outlet, and power outlet.
8. Describe the purpose of the National Electrical Code and the Wisconsin Administrative Code.
9. Describe how to wire and control an electrical outlet.

Supplies

Handout: "Notice of Apprenticeship Opportunity"
Handout: Blueprint (1 sheet)
Handout: Chapter ILHR16 of the Wisconsin Administrative Code and a section from the National Electrical Code (N.E.C.)
Complete set of electrician's hand tools

Conduit benders - 1 for every 2 students
½" electrical metallic tubing - 1 piece for every 2 students
Example of a switchbox
Small stud wall
1 2-gang plastic nail-on switch box
5 electrical installation stations
5 plastic nail-on round boxes
5 plastic nail-on device boxes
5 3-way switches
5 single pole switches
1 duplex receptacle
1 keyless socket
5 light bulbs
10' 14-3 NM-B wire
20' 14-2 NM-B wire
1 electricians angle drill
1 wood boring bit (½" - 3/4")
10 ½" plastic staples
45 yellow wire nuts
AC cable
ENT - electrical non-metallic tubing
PVC rigid non-metallic conduit
Rigid metallic conduit
Large conductors
Various enclosures - metallic and non-metallic

Safety Issues

- Explain that material handlers and first year apprentices do not handle energized circuits.
- Explain how the handling of energized circuits is to be avoided whenever possible.
- Review safe handling of a drill motor.
- Mention basic power and hand tool safety.

Activities

1. (15 minutes) Describe job duties and working conditions of an electrician. Differentiate the work of an electrical lineworker and electronics technician from that of an electrician. Describe related careers that might be pursued after becoming an electrician. Examples include contractor, business manager, electrical inspector, and electrical engineer.

2. (10 minutes) Describe the application, hiring procedures, and goals of an electrical apprenticeship. Discuss the ranking system, variability in number of positions available annually, wages and benefits.

3. (15 minutes) Show students the hand tools, briefly describing the purpose of each tool. Show common materials used by electricians, such as electrical metallic tubing, and intermediate metal conduit.

4. (25 minutes) Demonstrate the use of a ½" conduit bender in bending a 90°. Briefly explain deduct method for determining location of bend. Demonstrate other bends such as offsets and kicks. Have each student bend a 90° on a piece of ½" metallic tubing.

5. (10 minutes) Discuss the importance of the National Electrical Code to electrical work. Show examples of how the NEC applies to the switchbox [Article 210-70(a)(b)(c)].

6. (15 minutes) Describe major wiring methods and related applications: cabling, raceway, and wireway systems.

7. (15 minutes) Analyze the blueprint handout. Have the students identify the basic electrical symbols.

8. (15 minutes) Show the students a model of a switchbox and explain its function in an electrical system.

9. (15 minutes) Explain the wiring installation process for constructing the wiring system. Briefly examine code articles which will apply to the construction of the project [Articles 336, 300-4(a)(1), 300-14, 310-16, 370-6].

10. (35 minutes) Divide the class in two groups and have each group construct the wiring system project. The class will install a 100-amp service entrance panel with two switches, receptacle, and light in a preconstructed stud wall.

11. (10 minutes) Explain the theory of operation of the wiring system, describing effect of switches on the circuit.

Resources

Madison Area Electrical Joint Apprenticeship Committee (1992) "Notice of Apprenticeship Opportunity", Madison, WI.
Blueprint (1 sheet)
Chapter ILHR16 of the Wisconsin Administrative Code and a section from the National Electrical Code 1993 (1992) National Fire Protection Association, Quincy, MA.

ELECTRICAL
LESSON PLAN

Unit 2: Wiring Techniques — Time: 6 hours

Background

In this unit, students will install an electrical system in a garage. Information learned in the "Introduction to Electrical Work" session provides a foundation for this hands-on experience.

Competencies

By the end of this unit, the student should be able to do the following:

1. Use step-ladder safely.
2. Operate electrical power tools safely.
3. Describe the importance of communicating with the customer to establish needs.
4. Install non-metallic cable and outlets according to a blueprint.
5. Describe several of the requirements of the National Electrical Code for electrical installation in a garage.

Supplies

Non-metallic cable - per blueprint
Outlet boxes - per blueprint
Panel board - per blueprint
Connectors for non-metallic cable
Wire nuts - various sizes
2 ground rods
4 copper connectors
Circuit breakers
Keyless fixtures
Outside fixtures
Switches
Power boxes
Wire staples
GFCI receptacles
Safety goggles

2 right-angle drills
1 hole hawg
2 cordless drills
1 sawzall
1 masonry power drill
Wood bits - variety
Masonry bits - variety
Drywall screws
2 - #2 phillips bits
5 Electricians' pouches with tools
Step-ladders
Extension cords
Section from the National Electrical Code (N.E.C.)

Safety Issues

- Explain that material handlers and first year apprentices do not handle energized circuits.
- Explain how the handling of energized circuits is to be avoided whenever possible.
- Review safe handling of a drill motor.
- Mention basic power and hand tool safety.

Activities

1. (15 minutes) With reference to the handout, "Ladder Safety", demonstrate proper ladder safety. Have students practice techniques.

2. (10 minutes) Design the temporary cords and GFCI (Group Fault Circuit Interrupters) protection.

3. (15 minutes) Explain power tool safety and operation.

4. (10 minutes) Review the electrical blueprint and needs with the customer.

5. (20 minutes) Explain placement and layout of electrical parts, and National Electrical Code requirements for electrical installation in a garage.

6. (30 minutes) Demonstrate layout and rough-in of the electrical system. Explain the four group stations: 1) non-metallic cable installation, 2) vice box installation, 3) vice termination, and 4) feeding panel installation.

7. (105 minutes) Divide class into groups to perform different tasks.

8. (105 minutes) Allow groups to cross-train each other.

9. (10 minutes) Energize completed system.

10. (20 minutes) Allow time for clean-up.

11. (20 minutes) Review installation with the customer.

Resources

National Fire Protection Association (1992) National Electrical Code 1993, Quincy, MA.
Tradeswomen Magazine, Volume 2 #1, Spring 1982, "Ladder Safety", San Francisco, CA.

IRONWORK
LESSON PLAN

Unit: Ironwork Basics Time: 3 hours

Background

This unit will provide the student basic knowledge and skills that are needed in the ironworking industry. This lesson plan, when implemented, should provide instructor/student interaction and hands-on training.

Competencies

By the end of this unit, the student should be able to do the following:

1. Discuss the ironworking industry, physical aspects of the trade, union membership, and job-related occupations.

2. Perform rigging knot, bends, hitches.

3. Explain the international crane symbols.

4. Identify welding processes: SMAW, GTAW, GMAW, and OXY/Fuel.

Supplies

Handout: "Madison Area Ironworker Apprenticeship Program"
Handout: "Basic Rigging Knots, Bend, Hitches"
Handout: "Basic Ironworker Hand Tools"
Transparencies: Types of cranes, chain and cable hoists
Video: International Crane Signals
Video: Ironwork Trade
Video: Welding Processes
VCR and monitor
Overhead
Hobart Pocket Welding Guide
120' ¼" nylon sash cord

Safety Issues

- Personal apparel.

- Personal safety equipment; i.e., eye protection, hand protection, head protection, foot protection, safety belts/harnesses.
- Job-related safety.

Activities

1. (20 minutes) Discuss the demand for ironworkers. Also, relate to the students the demands the trade will place on them as well as the demands of the local union. Stress the physical aspect of the trade. Allow time for questions. Point out other possible occupations that are related to the ironworking industry; i.e., welder, estimator, safety officer, bridge inspector, owner/contractor.

2. (30 minutes) Issue each student one 6' length of ¼" nylon sash cord for tying knots, bends, hitches. Demonstrate bowline, square knot, clove hitch, triple slider hitch, and sheet bend. Students will perform ties.

3. (30 minutes) Show International Crane Signals video and time for discussion.

4. (10 minutes) Show overhead transparencies depicting types of cranes and chain and cable hoists.

5. (90 minutes) Go to the Welding Lab (Room 904). Show overhead transparencies, videos or demonstrate to explain OXY/GAS welder, shielded metal arc weld (SMAW), tungsten/gas arc weld (GTAW or TIG), gas metal arc weld (GMAW or MIG). Explain basic electricity used in welding. Demonstrate setting of welding machine. Demonstrate and explain electrode selection. Demonstrate welding a flat bead.

Resources

Construction Safety Association of Ontario, (1981) Crane Handbook, Construction Safety Association of Ontario, Toronto, Canada.

_____ (1982) Mobile Crane Manual, Construction Safety Association of Ontario, Toronto, Canada.

Hobart Brothers Company, (1988) Pocket Welding Guide, Troy, OH.

Instruction Safety of Ontario, Canada, (1986) International Crane Signals, Ontario, Toronto, Canada.

International Association of Bridge, Structural, and Ornamental Ironworkers, (1990) Basic Rigging for Ironworkers, Manual III,"Basic Rigging Knots, Bend, Hitches", Washington, DC.

_____ (1990) Basic Rigging for Ironworkers, Manual III,"Basic Ironworker Hand Tools", Washington, DC.

_____ (1988) Basic Rigging for Ironworkers, Manual III,"Welding Processes", Washington, DC.

Madison Area Ironworkers Joint Apprenticeship and Training Committee, (1992) "Madison Area Ironworker Apprenticeship Program", Madison, WI.

_____ (1992) "Occupational Description", Madison, WI.

Madison Ironworkers Local 383, (1987) Ironwork Trade, Madison, WI.
Newberry, W. G., (1977) Handbook for Riggers, Calgary, Alberta, Canada.
Welding equipment and lab, MATC, Commercial Avenue Education Center, Room 904, 2125 Commercial Avenue, Madison, WI.

MACHINE TOOL
LESSON PLAN

Unit 1: Basic Machining — Time: 3 hours

Background

This unit gives students the feel of what it's like to work in a shop. The lesson plan is very informal allowing students to advance at their own pace. Those who want to delve into the hands-on project further can tackle additional small projects. Those who want more of an overview can move among several small exhibits in the shop. Throughout the day, instructors encourage job-related questions and provide examples from their own experience.

Competencies

By the end of this unit, the student should be able to do the following:

1. Describe job and wage prospects for the machine tool industry.
2. Describe three basic machines used in the machine tool industry.
3. Read a simple blueprint and understand decimal equivalents.
4. Make a simple part on the manual mill.
5. Recognize a die and give a simple explanation of how it works.

Supplies

1x1½x½ aluminum blanks with slot roughed out
8-32 socket-head cap screw, 1"
2 ½" end mills
3 #29 stub drills
4 8-32 taps
3 82° countersinks
4 tap handles
4 tap guides
5 vise stops
2 edgefinders
1 calculator
6 calipers
1 set - allen wrenches
3 files

Safety Issues

- Students should be wearing appropriate clothing and safety glasses.
- Remove jewelry and secure long hair.
- Review potential hazards of running a mill.

Activities

1. (20 minutes) Discuss demand for machine tool workers, training and experience, and current wage scale. Differentiate between machinist and tool & die maker. Pass out job-related handouts. Allow time for questions.

2. (10 minutes) Walk through shop. Show three basic machines used in machine shop: mill, lathe, and grinder.

3. (10 minutes) Lay groundwork for C-clamp project. Review details of C-clamp blueprint. Explain what decimal equivalents are and how they are measured on a digital readout. Pass out project-related handouts. Discuss shop safety.

4. (120 minutes) Demonstrate how to mill slot in C-clamp project. Have each student mill slot in C-clamp. Demonstrate how to use edgefinder. Have each student locate and drill hole in C-clamp. Demonstrate how to tap a hole. Have each student tap a hole to complete their own C-clamp.

5. (20 minutes) Present overview of tool & die making. Show several dies, discuss how they are made and how they work.

Resources

Basic Machinists' Tool List
C-Clamp Blueprint
Wisconsin Career Information Systems, (1991) Occupations Handbook, "Tool and Die Makers Occupational Description", Madison, WI.
Van Bramer, P. and Redsten, D. (1993) Follow-up Study of 1992 Graduates, Madison Area Technical College, Madison, WI.
Bailis, M. Y., The Metalworking Technician: A Human Resource Dilemma, ATEA Journal, December 1991/January 1992.
Blueprints
Machine tool equipment and lab, MATC, Truax Campus, Room 86, 3550 Anderson Street, Madison, WI.

MACHINE TOOL
LESSON PLAN

Unit 2: Computer Numeric Control — Time: 3 hours

Background

Computer numerically controlled (CNC) machining is one of the more important specialties in the machine tool field. This unit introduces the student to the CNC mill.

Competencies

By the end of this unit, the student should be able to do the following:

1. Describe steps for writing a program for the CNC mill.

2. Describe how a CNC mill improves upon a manual mill.

Supplies

PC computer and disc for each student
Master Cam computer software (or similar)
Plastic keychain blanks

Safety Issues

- Students should be wearing appropriate clothing and safety glasses.
- Remove jewelry and secure long hair.
- Review potential hazards of running a mill.

Activities

1. (90 minutes) Assign each student a computer. Walk them step-by-step through the program using their initials.

2. (90 minutes) Have each student load their initials program into the CNC mill and then mill their own initials onto a key chain. On a second CNC mill, preprogrammed and set up, mill a complex micrometer design on the back of each keychain. Ask students to imagine milling such a design by hand - especially on many pieces. Return to manual mills to drill holes in keychains.

Resources

Machine tool equipment and lab, MATC, Truax Campus, Room 86, 3550 Anderson Street, Madison, WI.

OPERATING ENGINEERS
LESSON PLAN

Unit: Introduction to Operating Engineers — Time: 3 hours

Background

The purpose of this session is to provide an introduction to the skills and work performed by operating engineers, components of the apprenticeship program for operating engineers, and career opportunities available to operating engineers.

Competencies

By the end of this unit, the student should be able to do the following:

1. Describe career opportunities available to operating engineers.
2. Identify qualifications necessary for acceptance into the operating engineer apprenticeship program and the application process.
3. Describe the steps involved in the apprenticeship of an operating engineer and the types of training available at the Operating Engineers training site in Coloma, Wisconsin.
4. Identify the major components of machinery that operating engineers use: hydraulics, electrical systems, power trains, and engines.
5. Describe the importance of moving earth with skill and efficiency and meeting specifications for depth of excavation.
6. Describe the importance of safety on construction sites and how the operating engineers insure safety.

Supplies

Handout: "Do You Want to be an Operating Engineer"
Handout: "Prospective Apprenticeship Candidate Memo"
Video: Construction - Is It Safe?
VCR and monitor

Safety Issues

- None.

Activities

1. (15 minutes) Describe career opportunities, job duties, and working conditions for operating engineers. Describe the operating engineers' union.

2. (15 minutes) Explain the operating engineers apprenticeship program, application procedures, and training site. Handouts: "Do You Want to be an Operating Engineer" and "Prospective Candidate Memo".

3. (30 minutes) Discuss major components of machinery that operating engineers use by showing copies of the "Fundamentals of Service" series, including Hydraulics, Electrical Systems, Power Trains, and Engines.

4. (30 minutes) Discuss moving earth with efficiency and skill using the textbooks: Moving the Earth, the Workbook of Excavation and Grade Checking for Operating Engineers.

5. (60 minutes) Show and discuss the video of the Operating Engineers Local 319 titled Construction - Is It Safe?.

6. (15 minutes) Discuss safety issues involved with the operation of heavy equipment.

7. (15 minutes) Discuss any further questions and concerns.

Resources

Johanning, M., (1986) Fundamentals of Service - Hydraulics, Electrical Systems, Power Trains, and Engines, Deere & Co., Moline, IL.
Nichols, H. L. Jr., (1980, Third Edition) Moving the Earth, The Workbook of Excavation, North Castle Books, Greenwich, CT.
Operating Engineer/Joint Apprenticeship and Training Committee, Do You Want to be an Operating Engineer, Madison, WI.
Operating Engineers Local 319, Construction - Is it Safe?, Madison, WI.
Operating Engineers Training Trust, (1979) Grade Checking for Operating Engineers, Book 1, Operating Engineers Training Trust, Whittier, CA.
Wisconsin Operating Engineers, "Prospective Apprenticeship Candidate Memo", Coloma, WI.

PAINTING & DECORATING
LESSON PLAN

Unit: Introduction to the Painting & Decorating Trade — Time: 3 hours

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Background

The purpose of this session is to introduce persons not familiar with the painting and decorating trade to the job opportunities that the trade can provide, the facets of the trade, the competencies and skills that must be mastered to become a qualified journeyperson, the terms of apprenticeship, and the method of instruction provided to insure that the subjects and skills are mastered.

Competencies

By the end of this unit, the student should be able to do the following:

1. Identify the different facets covered by the painting and decorating trade.
2. Describe the apprenticeship process, its wage structure, and related classroom instruction.
3. Review the safety practices, in general, that must be observed by all workers in the painting and decorating trade.
4. Identify some basic tools used in the trade and their purpose.
5. Mix secondary colors from primary colors.
6. Identify basic woodgraining, stripping, and glazing techniques.
7. Describe the importance of proper cleaning and maintenance of tools used.

Supplies

Handout: "Introduction to the Painting and Decorating Trade"
Video: Reach out for Tomorrow
VCR and monitor
Overhead
Different types of quality brushes
Conventional spray gun, airless spray gun, and electrostatic spray gun or transparencies of the same
Set of complete wallcovering tools

One direct pressure abrasive blast pot (or transparencies) along with the safety equipment, such as fresh air hood, etc.Several sets of woodgraining and glazing tools, including rubber gloves
Pre-primed panels for practice
Several sets of universal colors
Mixing buckets
Four quarts of glazing liquid
Appropriate cleaning solvents
Hand cleaner and rags

Safety Issues

The instructor must stress safety aspects as they pertain to the subjects discussed and demonstrated: falls when working with ladders and scaffolding (the most common cause of injuries in the trade); back injuries from lifting improperly (the second most common injury); and solvent toxicity, especially as it pertains to pregnant or nursing women. These safety aspects are not presented to scare anyone away from the trade. It must be stressed that any material becomes a hazard only when it is handled improperly, but a person must be aware that these hazards do exist.

Activities

1. (10 minutes) Distribute the handout, "Introduction to the Painting and Decorating Trade". Review different facets of the trade and related career opportunities.

2. (10 minutes) Describe terms of indenture, wage structure, and related classroom instruction.

3. (25 minutes) Show the video, Reach out for Tomorrow.

4. (10 minutes) Review the basic safety practices that must be observed by all workers in the painting and decorating trade.

5. (10 minutes) Demonstrate the different tools used in the painting and decorating trade (such as types of brushes, spray equipment, hand and automatic drywall taping tools, abrasive blast equipment, wallcovering tools, etc.). Show and explain the use of the tools and how they work.

6. (30 minutes) Demonstrate basic color theory and have students mix colors.

7. (70 minutes) Demonstrate the use of glazing liquid, the use of woodgraining tools and techniques, and stripping and glazing tools and techniques. Have students practice techniques.

8. (15 minutes) Demonstrate proper cleaning and maintenance of tools used. Have students clean the tools used.

Resources

Langenstroer, L., (1993) "Introduction to the Painting and Decorating Trade", Tools for Tomorrow: Women in the Trades Trainer's Guide, Madison Area Technical College, Madison, WI.

National Joint Painting and Decorating and Drywall Apprenticeship and Training Committee (1989) Reach out for Tomorrow, Washington, DC.

PLUMBING
LESSON PLAN

Unit 1: Basic Plumbing — Time: 3 hours

Background

This unit focuses on the acquisition of basic knowledge and skills in the field of plumbing. The lesson plan emphasizes informal interaction, instructor modeling and hands-on experience. Instructors should expect that some students will be hesitant during discussion while others will be hesitant during skill-building activities. Pairing hesitant students with those who show more initiative encourages involvement. However, the instructor should watch carefully for those students who foster dependency in more anxious students. They should be paired with more independent partners.

Competencies

By the end of this unit, the student should be able to do the following:

1. Describe career opportunities in plumbing in terms of demand, required training and experience, and wage.
2. Describe related job opportunities (i.e. soil testing, designing, sales, etc.).
3. Describe types of plumbing systems: water supply, drain/vent and septic systems.
4. Identify common plumbing tools.
5. Identify PVC connectors and elbows.
6. Measure, cut, and glue PVC joints using pipe and couplings.
7. Recognize and repair common components in faucets.
8. Describe how to make simple repairs to clogged drain lines.

Supplies

Handout: "Madison Area Plumbing Joint Apprenticeship Committee Occupational Description"
Demonstration kit: PVC fittings - one each of the following:

3x2 tee
3x2 wye
1 ½" coupling
1 ½" repair coupling
1 ½" wye
1 ½" tee
1 ½" vent ell
1 ½" ¼ bend
1 ½" LS ¼ bend
1 ½" 1/8 bend
1 ½" 1/8 bend street
1 ½" 1/16 bend
1 ½" 1/16 bend street
2x1 ½ coupling
2x1 ½ bushing

PVC glue
PVC cleaner
10 folding 6' rules
Pipecutters
6 hand wood saws
6 drills with 11/16" flat wood bit
1' of PVC sct 40 (1½" for each student)
Polishing cloth or sand cloth
1 roll of masking tape
Pencils
Broken faucets, sinks, and toilets
Tools and washers for faucet repair
Wisconsin Administrative Codes: Plumbing
1½" PVC coupling for each student

Safety Issues

- Check to be certain that students are wearing appropriate clothing and that long hair is tied back.
- Review safe handling of hand saws.
- Warn students about the sharp edges on broken porcelain fixtures.
- Check warnings on the PVC glue and PVC cleaner and review the warnings with students.

Activities

1. (15 minutes) Briefly discuss the demand for plumbers, training and experience to become a plumber, and current wage scale in Wisconsin. Hand out copies of Madison Area Plumbing Joint Apprenticeship Occupational Description Sheet. Allow time for questions.

2. (15 minutes) Mention opportunities in related fields such as soil testing and describe how students can obtain additional information about these occupations.

3. (15 minutes) Present an overview of domestic water, sewer/vent, and septic systems using a diagram drawn on the board or illustrated in a handout.

4. (30 minutes) Briefly describe the difference between fittings and discuss how each is used. Include a description of the two nomenclature systems (eg. ½" of 90 degree bend vs. ½" ¼ bend). Using the set of connectors and elbows listed in the supply section, give a brief, ungraded quiz in which students identify each component.

5. (15 minutes) Briefly show the students common tools used in plumbing. Name the tools and continue to use the names and encourage the students to use the correct terms during other classroom activities.

6. (30 minutes) Demonstrate how to measure, cut, and glue a short (1½") section of PVC sct 40 to a 1½" coupling. Emphasize care in cleaning surfaces, accurate measurement, and care in handling glue. Have each student cut sections of PVC pipe and glue couplings to sections of pipe.

7. (30 minutes) Using the selection of different faucets provided, have each student slowly disassemble a faucet. Point out similarities and differences in faucet construction. Using one of the more common faucet types, demonstrate how to replace washers. Have students replace a washer as they reassemble the faucets.

8. (30 minutes) Ask students for personal experiences of clogged plumbing. Using diagrams on the board and broken fixtures, explain how to unclog the sinks, tubs, and toilets described in students' examples.

Resources

Kohler Company, (1983) "Kohler Faucet Stems", Kohler, WI.
Milwaukee Water Works, (1988) "Stop the Plumbing Noise", Milwaukee, WI.
Madison Area Plumbing Joint Apprenticeship Committee, (1992) "Occupational Description", Madison, WI.
Madison Area Technical College Apprenticeship Division Apprenticeship Handbook, Madison, WI.

PLUMBING
LESSON PLAN

Unit 2: Septic Systems — Time: 3 hours

Background

Septic systems are common in suburban and rural Wisconsin. This unit explains the differences between different types of systems and teaches the student design elements and basic survey skills.

Competencies

By the end of this unit, the student should be able to do the following:

1. Compare different types of septic systems.
2. Explain how a site for a septic system is chosen.
3. Identify the correct soil type for a septic system.
4. Explain the basic design of a septic system.
5. Determine the slope of the site using a transit and builder's level.

Supplies

Video: Septic Systems: Mound System Design & Installation
VCR and monitor
Sets of labeled and unlabeled soil samples
Drain tray
6 empty glass jars
Jar of water
Pencils and paper or slope calculation worksheets
4 Transits or builders level and poles
8 50' tape measures
Drawing machine or T-square with 30-60-90 triangle for each student
Drafting paper
Architectural scales for each student
Masking tape
Wisconsin Administrative Codes: Plumbing

Safety Issues

- Check students for appropriate attire and that long hair is tied back.
- Remind student of the traffic danger if transit work occurs off site or near streets.

Activities

1. (50 minutes) Show the video, Septic Systems: Mound System Design and Installation. Review key points. Explain the different septic systems used in Wisconsin.

2. (20 minutes) Show students samples of different soil types and discuss which are suitable for septic systems. Show how water percolates through each type by filling a glass jar with soil and slowly pouring water over the top. Have students identify unlabeled samples of each type of soil. Allow them to feel wet and dry samples. Discuss the different "feel" of sand, clay, and loam. (Save soils by room drying wet samples).

3. (40 minutes) Separate students into pairs or groups of three. Explain how to use contour lines to determine slope. Explain use of a builder's level and transit to determine elevation. Work several examples on the board, then have student pairs or groups solve as many slope problems as time permits.

4. (70 minutes) Using a transit and builder's level, determine the slope of a predetermined site. Be certain that each student learns each component of taking readings. Explain how to make an isometric drawing. Have each group or pair of students calculate the slope of the site and produce a rough isometric drawing.

Resources

Western Wisconsin Technical College (1989) Septic Systems: Mound System Design and Installation, LaCrosse, WI.
Soil Survey Maps (available from County Soil Service).
Docken, L. (1982), The Care and Feeding of Your Septic System, Galesville, WI: Docken Plumbing.
Wisconsin Department of Health and Social Services (1979) Soil Tester Manual, Madison, WI: Bureau of Environmental Health.
Wisconsin Department of Industry, Labor, and Human Relations, Drain and Vent System Design, Madison, WI.
_____ Wisconsin Administrative Codes: Plumbing, Madison, WI.

SHEET METAL
LESSON PLAN

Unit 1: Introduction to the Sheet Metal Trade — Time: 1½ hours

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Background

This unit is designed to give students some understanding of the advantages, obligations, and mechanics of a sheet metal apprenticeship. Information is given on trade conditions in the nation and in our local area. Students are encouraged to ask questions about trade fields, Joint Apprenticeship Committees, unions, working conditions, and common work/training tasks.

Competencies

By the end of this unit, the student should be able to do the following:

1. Identify career opportunities in the sheet metal trade.
2. Describe sheet metal apprenticeship requirements.
3. Describe various areas of the sheet metal trade.
4. Describe sheet metal apprenticeship training.

Supplies

Laser disc: The Cutting Edge - A Sheet Metal Career
Laser disc player and monitor
Video: Journey Into Tomorrow: Careers in Steamfitting and Sheet Metal
VCR and monitor
Booklet: Careers in Sheet Metal
Wisconsin, American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE), and Sheet Metal and Air Conditioning National Association (SMACNA) code books
NTF blueprint book, print and specification book
HVAC, Industrial, Kitchen, Architectural, and Fittings and work examples
Air balance equipment and controls
Drafting and layout examples and equipment

Safety Issues

- None.

Activities

1. (25 minutes) Cover sheet metal background and history of trade. View and discuss content of NTF disc and MJAC video. Discuss career opportunities, industry stability, expected growth, and technological changes at the national and local levels.

2. (30 minutes) Explain the sheet metal apprenticeship program. Cover the physical, mental, and educational requirements. Explain "Exhibit A" and its work/school requirements. Discuss wage structure, career ladder, and potential earning level attainment.

3. (15 minutes) Display and pass out representative objects from the major sheet metal trade areas. Discuss work areas unique to certain areas of the country and common trade area divisions. Discuss apprentice activities in the HVAC, Residential, Architectural, Industrial, Sign, Service, Specialty, and Kitchen shops.

4. (20 minutes) Discuss and display apprentice school work. Cover drafting, layout, fabrication, math, video, and homework assignments. Discuss competency based education. Explain how school training is integrated with outside work activities and night school programs. Hand out brochures and applications. Field questions.

Resources

American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE), American Society of Heating, Ventilating, Air Conditioning and Refrigeration Handbook, New York, NY.

Auto Cad, version 10, (1989) Autodesk, Inc.

Budzik, R. S., (1971) Sheet Metal Technology, Howard W. Sams Co. Inc., Indianapolis, IN.

Kaberlein, J. J., (1973) Shortcuts for Round Layouts, Benzinger, Bruce and Glencoe, Inc., New York, NY.

_____ (1973) Triangulation Shortcut Layouts, Benzinger, Bruce and Glencoe, Inc., New York, NY.

Mechanical Contractors Association (1988) Journey Into Tomorrow: Careers in Steamfitting and Sheet Metal, Madison, WI.

National Training Fund (1990) The Cutting Edge - A Sheet Metal Career, the Kamber Group, Washington, DC.

_____ (1987) Sheet Metal Apprentice Workbooks 1-4, Alexandria, VA.

_____ (1989) Careers in Sheet Metal, Alexandria, VA.

_____ (1983) Community Area Care Center (CACC) Blueprint, Alexandria, VA.

_____ (1983) Reading Plans and Specifications, Alexandria, VA.

SMACNA, (1976) Fibrous Glass Duct Construction Standards, Vienna, VA.

_____ (1978) Fire Damper Guide, Vienna, VA.

_____ (1976) Low Pressure Duct Construction Standards, Vienna, VA.

Wisconsin Department of Industry, Labor, and Human Relations, Wisconsin Administrative Codes: Building, Heating, Ventilating, and Air Conditioning.

Zinngrabe, C. J. and Schumacher, F. W., (1975) Practical Layout for the Sheet Metal Shop, Delmar Publishers, Inc., Albany, NY.
_____ (1970) Sheet Metal Workers Pocket Manual, Washburne Trade School, Chicago, IL.

SHEET METAL
LESSON PLAN

Unit 2: Sheet Metal Shop Introduction — Time: 2½ hours

Background

This unit is designed to introduce the student to the tools and equipment commonly used in sheet metal shops. Special emphasis is given to safe work practices during discussions and demonstrations.

Competencies

By the end of this unit, the student should be able to do the following:

1. State general sheet metal shop safety rules.
2. Describe sheet metal brake function and operation.
3. Describe sheet metal roller function and operation.
4. Describe function and operation of shear, spot welder, and roll former.
5. Describe function and operation of common sheet metal hand tools.
6. Describe operation and function of specialty equipment; i.e., plasma cutter, Pullmax, unishear, Beverly, and punch press.

Supplies

3x4 and 6x18 - 28 gage sheet metal blanks
Face shields, goggles, gloves, ear plugs, and leather jackets
Sheet metal hand tools
Shop equipment

Safety Issues

- Eye protection requirements.
- Shoe and dress requirements.
- Ear plug use.
- Glove use at welder, plasma cutter, and rollers.
- Hair length with drill press use.

- Special welding/cutting rules.
- Shop power cut off location.
- Medical box location.

Activities

1. (15 minutes) Discuss shop safety rules.

2. (30 minutes) Explain use and operation of 8' brake, finger brake, bar folder, and cheek bender. Bend hems, simple bends, and compound bends. Have each student bend a drive cleat in the bar folder.

3. (20 minutes) Explain use and operation of rollers. Roll up metal and make collar for demonstration. Explain roller spacing and roller grooves. Have each student roll up drive cleats made on bar folder.

4. (35 minutes) Explain use and operation of shear, spot welder, and roll former. Shear several pieces of metal using back and front gages. Have students shear small pieces. Spot weld several pieces of metal together. Explain heat settings, tip cleaning, and timing. Have each student spot weld metal together. Run small duct through pittsburg machine and hammer duct together. Run piece through pipe lock, roll, and hammer together.

5. (25 minutes) Explain and demonstrate use of tools commonly used in sheet metal work. Stress need to use tools properly in order to make work easier and to prevent tool damage. Have each student notch, scribe, crimp, fold, pop rivet, and drill metal blanks. Have each student use automatic center punch, prick punch, and Whitney.

6. (25 minutes) Explain and demonstrate plasma cutter use on steel, stainless steel, aluminum, and galvanized. Have interested students cut out patterns using the plasma torch. Demonstrate use of Pullmax to dish out a metal blank. Explain other capabilities of machine and show various dies. Have interested students dish out metal blanks. Stress need to wear ear plugs. Demonstrate and explain the capabilities of a unishear. Have interested students use unishear to cut a curved pattern. Demonstrate the Beverly shear and the punch press.

Resources

Sheet metal equipment and lab, MATC, Commercial Avenue Education Center, Room 906, 2125 Commercial Avenue, Madison, WI.

SHEET METAL
LESSON PLAN

Unit 3: Fitting Fabrication — Time: 2 hours

Background

This unit is designed to give the student an opportunity to fabricate a sheet metal fitting. The fitting is chosen by the instructor to incorporate a wide variety of shop procedures, equipment use, and student cognitive interaction. Students are aided throughout the fabrication according to individual needs. Students should experience a positive feeling through a sense of individual accomplishment.

Competencies

By the end of this unit, the student should be able to do the following:

1. Use a template to layout a sheet metal pattern.
2. Cut out a sheet metal pattern.
3. Form up a sheet metal fitting.
4. Assemble a sheet metal fitting.

Supplies

Sheet metal templates and blanks
Sheet metal hand tools and equipment
Layout benches
Ink markers
Cords, drills, pop rivets

Safety Issues

- None.

Activities

1. (60 minutes) Instructor demonstrates the use of a sheet metal template on a precut metal blank. Students are given template with blanks and are asked to scribe, center punch, and mark blank.

2. (15 minutes) Instructor demonstrates the cut out of pattern. Students are given hand tools and are asked to cut out their previously marked blanks.

3. (30 minutes) Instructor demonstrates the form up of fitting using shop equipment. Students are asked to form up fittings and are encouraged to use any equipment available; i.e., equipment other than the instructor used.

4. (15 minutes) Instructor demonstrates assembly of fitting using pop riveter and spot welder. Students are asked to finish assembly of fitting.

Resources

Jones, R. P. Sr., Templet Development for the Pipe Trades Delmar Publisher, Inc., Albany, NY: pp 29, 31, 32.
Sheet metal equipment and lab, MATC, Commercial Avenue Education Center, Room 906, 2125 Commercial Avenue, Madison, WI.

STEAMFITTING
LESSON PLAN

Unit: Basic Steamfitting Skills — Time: 3 hours

Background

In this unit, students will learn to construct a pipe assembly designed to fit in a confined space. Instructors should be particularly alert for fire hazards. Students often concentrate more on the manipulative responses than on safety.

Competencies

By the end of this unit, the student should be able to do the following:

1. Describe career opportunities in steamfitting in terms of demand, required training and experience, and wage.
2. Describe related job opportunities as heating, ventilation, and air conditioning (HVAC) technicians in industry and government.
3. Describe the work performed by a steamfitter.
4. Measure copper pipe accurately.
5. Cut copper pipe accurately and safely.
6. Safely solder copper pipe that does not leak.
7. Compute angles required for pipe assemblies located in confined spaces.

Supplies

Handout: "Madison Area Steamfitters Joint Apprenticeship Committee Occupational Description"
Handout: "Make-up and Take-off"
50 3/4" 45 degree copper elbows (sweat 45s)
50 3/4" 90 degree copper elbows (sweat 90s)
40' 3/4" copper pipe (type M)
2 propane hand-held torches with tips
10 tubing cutters
10 folding 6' rules (with inside reading)

15 compasses with lead
4 t-squares
1 roll 50/50 solder
1 can flux paste
5 3/4" copper cleaning brushes
Pencils and paper for each student
8 Pipe stations
2 demonstration laboratory fit-up boxes

Safety Issues

- Check students to be certain that attire is appropriate (no dangling or loose sleeves or scarves) and that long hair is tied back.
- Remind students that tubing cutter blades are sharp.
- Remind students that pipe, elbows, solder, and torch tips remain hot for a long time and will cause burns when hot.
- Begin the soldering part of the lesson with a demonstration of the correct method of cutting and handling pipe and lighting and handling a torch.

Activities

1. (15 minutes) Discuss the job market demand for steamfitters, the training and experience required to become a steamfitter, and the wage scale in Wisconsin. Mention related job opportunities in HVAC work and as utility/government technicians. Hand out Madison Area Steamfitters Joint Apprenticeship Committee's Occupational Description. Allow time for questions.

2. (30 minutes) Inspect and discuss MATC's Commercial Avenue Building's equipment room. Explain how the various components of the HVAC system are integrated into the system. Explain the steamfitter's role in constructing and maintaining HVAC systems.

3. (30 minutes) Demonstrate the correct and safe way to measure, cut, and clean copper pipe. Have the students measure, cut, and clean sections of pipe to be used in the project described in part #4.

4. (30 minutes) Explain how to fit pipe in confined spaces. Using an example on an overhead transparency, "Make-up or Take-off" show the students how to compute angles for pipe layouts. Have the students calculate angles for a layout confined to a demonstration box.

5. (15 minutes) Demonstrate the correct way to light and handle a propane torch, hot pipe, flux, and solder. Remind students to avoid breathing fumes for health reasons. Demonstrate the correct method to solder a joint.

6. (60 minutes) Have students take their calculations from part #3 and the pipe cut in part #2 to construct a pipe assembly that will conform to the dimensional limits of the demonstration box. Assist the students as needed to solder the fittings.

Resources

Franklin, Thomas W., Pipefitters and Pipe Welders Handbook, Glencoe Publishing, Encina, CA.

Madison Area Steamfitters Joint Apprenticeship Committee, (1992) "Occupational Description", Madison, WI.

Madison Area Technical College Apprenticeship Division, Apprenticeship Handbook.

National Joint Plumbing Apprenticeship & Journeyman Committee, (1968) "Make-up and Take-off", Washington, DC.

National Joint Steamfitter-Pipefitter Apprenticeship Committee (1977) Instruction Manual for Steamfitter-Pipefitter Journeymen and Apprentices, USA.

Wisconsin Department of Industry, Labor, and Human Relations, Wisconsin Administrative Codes: Building, Heating, Ventilating, and Air Conditioning, Madison, WI.

_____ Wisconsin Administrative Codes: Uniform Dwelling, Madison, WI.

TROWEL TRADES
LESSON PLAN

Unit: Basic Bricklaying Time: 6 hours

Background

This unit focuses on the acquisition of basic knowledge and skills in the field of bricklaying. The lesson plan emphasizes informal interaction and hands-on learning activities. Some students will be hesitant during discussion or hands-on activities; therefore, placing hesitant students with those who show more initiative may encourage involvement. It will be helpful to observe who can work well together.

Competencies

By the end of this unit, the student should be able to do the following:

1. Identify career opportunities in bricklaying and specialty fields in terms of demand, required training, experience, wages, and application procedures for apprenticeship.
2. Identify related job opportunities in blueprint reading, drafting, and management (owning your own business).
3. Identify safety procedures related to each task.
4. Describe various units of brick and where they are used.
5. Identify common bricklaying tools and equipment.
6. Identify mortars and their uses.
7. Identify anchoring devices and where they are used.
8. Erect a practice wall 4' long and 2 bricks high.

Supplies

Video: Bricklaying Tools: Choosing the Right One for You
Video: Bricklaying, Master the Craft and Make Your Mark
VCR and monitor
30 bricks per student

3 bags mortar
Tub for mixing mud
12 cubic ft. sand
1 roll string line
2', 3', 4' levels - wood or metal
Line blocks - 2 for each student
Hand tools for each student: trowel (11"), striking irons (2), brush, level, brickhammer, mortar boards, spacing ruler, modular ruler
Mason hoe, shovel
2 - 5 gal. buckets
Tempering cans
Bag of lime

Safety Issues

- Describe a safe workplace.
- Students should wear appropriate clothing.
- Long hair should be secured out of the way.
- Remind students to wear head, eye, and breathing protection.
- Check warning labels on hazardous materials.
- Proper use of power tools and equipment.

Activities

1. (15 minutes) Discuss the demand, training, experience, and wage scale in Wisconsin and nationally for bricklayers (trowel trades persons). Explain prerequisites of becoming an apprentice and application procedures.

2. (10 minutes) Point out specialty fields in masonry and masonry repair: lime and cement manufacturing, brick plants, stone quarries, and tile manufacturing. Explain to students how to acquire information about these specialty fields.

3. (10 minutes) Describe related job opportunities in the trowel trades: blueprint reading and management.

4. (15 minutes) Review safety issues regarding proper attire, personal protective equipment, and use of potentially hazardous materials through transparencies and slides.

5. (10 minutes) Explain the usage of various masonry materials. Critique students on how to identify proper application of masonry units.

6. (10 minutes) Explain the basic tools used by masons. Use proper terms to identify tools and their uses.

7. (35 minutes) Show students a sample of mortar, the ingredients used to make mortar, its characteristics, and time of workability. Show how to re-temper (make workable again) mortar after it begins to take (set). Have students practice mixing and re-tempering mortar.

8. (30 minutes) Demonstrate use of trowel (cupping method), and right and left hand application of trowel with mortar. Have students practice techniques.

9. (30 minutes) Demonstrate the use of various bricklaying tools and proper cutting techniques: brickhammer (cutting brick), striking irons, level, ruler, and brush. Have students practice the techniques. Explain how to clean a finished wall.

10. (10 minutes) Describe anchoring devices and where they are used, such as strap anchors, corrugated wall ties, dove tail anchors, etc.

11. (10 minutes) Describe masonry cleaning solutions, expansion control sealants, related applications, and techniques for repairing damaged masonry.

12. (120 minutes) Assign students to laboratory area and have them build practice walls: 4' long and 2 bricks high. Allow time for clean-up.

13. (15 minutes) Return to the classroom and have an open discussion. Be aware of the students' reaction to the masonry trade. Allow time for evaluation.

Resources

Bon Tool, (1991) Bricklaying Tools: Choosing the Right One for You, Gibsonia, PA.
Brick Institute of America, (1991) Bricklaying, Master the Craft and Make Your Mark, Reston, VA.

WELDING
LESSON PLAN

Unit: Welding Basics Time: 6 hours

Background

This unit provides the student with basic skills and knowledge in welding as an introduction to the welding industry. This lesson plan emphasizes hands-on skill building as well as instructor/student and student/student interactions. Instructors may find that some students are hesitant at the beginning of skill-building activities. Instructors may give students the option of working in pairs for a portion of the skill-building activities. This unit is most effective when taught using two instructors or an instructor and an assistant during the hands-on portion.

Competencies

By the end of this unit, the student should be able to do the following:

1. Describe career opportunities in welding, required training and experience, as well as per hour wage and benefits.
2. Explain what welding is and identify the characteristics of a properly made weld.
3. Describe personal and equipment safety considerations in relation to welding.
4. Demonstrate the safe set-up and operation of a Shielded Metal Arc Welding (SMAW) machine.
5. Perform several acceptable SMAW welds.
6. Compare the SMAW process to the Gas Metal Arc Welding (GMAW) process.
7. Demonstrate the safe set-up and operation of a GMAW machine.
8. Perform several acceptable GMAW welds.

Supplies

Handout: "Introduction to Arc Welding"
10 folding 6' rules
Safety glasses with side shields
Welding helmet with #10 or #11 lens

Welding skullcap (flame-proof beanie)
Leather welding gloves
Leather cape sleeves and apron
2 pieces 3/16" x 4" x 6" 1020 steel
2 pieces angle iron 3/16" thick, 2" legs, 8" long 1020 steel
15 - E6013 electrodes, 1/8" diameter

Safety Issues

- Personal apparel; i.e., cotton clothing, boots, no jewelry, scarf to tie back hair.
- Personal protective equipment; i.e., eye and face protection, hand protection, skin protection, foot protection.
- Ventilation.
- Job-related safety.

Activities

1. (20 minutes) Describe the different types of career opportunities available in the welding industry and the training and experience required. Discuss the prevalence of welded items in industry and society. Discuss the importance of welding to other industries. Answer student questions.

2. (30 minutes) Define welding and explain its function. Discuss the characteristics of a properly made weld. Discuss variables of welding procedures and how to achieve a "good" weld. Show examples of "good" and "bad" welds.

3. (30 minutes) Discuss electrical, heat, spark, and ultraviolet hazards inherent in electrical welding processes. Discuss safety practices. Show appropriate personal protective equipment, explain functions and rational for use. Answer student questions.

4. (60 minutes) Briefly explain how a SMAW machine works. Explain function of dials and switches. Briefly explain electrode selection. With machine off, demonstrate angle and manipulation of electrode. Supply each student with safety gear. Demonstrate proper weld procedure. Allow time for discussion. Then demonstrate the weld procedure again, changing some of the variables so students can see the effects. Again, allow time for discussion.

5. (90 minutes) Assign each student to a welding booth. Give students the option of pairing up for the first few welds. Provide metal and electrodes. Check that each student has on personal protective equipment. Have students set up machines and practice making welds on flat plate. Instructor should work with each student individually, watching the welds and making corrections as necessary. Direct students to make multiple-pass welds on angle iron as they develop in competence.

6. (15 minutes) Discuss the differences between SMAW and GMAW and the advantages/ disadvantages each has. Describe uses of each in industry.

7. (40 minutes) Briefly explain how a GMAW machine works. Explain function of dials and switches. Demonstrate proper weld procedure. Allow time for questions. Demonstrate the weld procedure again, changing some of the variables so students can see the effects. Allow time for questions.

8. (75 minutes) Assign each student to a welding booth. Provide flat metal plate. Check that each student has on personal protective equipment. Have students set up machines and practice making welds on flat plate. Instructor should work with each student individually, watching the welds and making corrections as necessary.

Resources

Hobart Brothers Company, (1988) Pocket Welding Guide, Troy, OH.
Jeffus & Johnson, (1984) Welding Principles and Applications, Delmar Publishers Inc., ISBN 0-8273-1806-5 (or other comprehensive welding textbook).
Lincoln Electric Company, (1973) The Procedure Handbook of Arc Welding, Lincoln Electric Company, Cleveland, OH.
Weihman, V., (1993) "Introduction to Arc Welding", Tools for Tomorrow: Women in the Trades Trainer's Guide, Madison Area Technical College, Madison, WI.
Welding equipment and lab, MATC, Commercial Avenue Education Center, Room 904, 2125 Commercial Avenue, Madison, WI.

WOODWORKING/CABINETMAKING
LESSON PLAN

Unit: Introduction to Woodworking Time: 6 hours

Background

This class concentrates on developing basic skills and terminology of a cabinetmaker. It will include an overview of job skills required for competency levels for job placement. Students will be encouraged to work both independently and as a team. The emphasis will be safety first; productivity second. Students will be allowed to seek their own pace in the fabrication process.

Competencies

By the end of this unit, the student should be able to do the following:

1. Understand scope of job opportunities in woodworking and related fields.
2. Identify hand and power tools used in class.
3. Demonstrate the proper use of safety devices, hand tools, and power tools.
4. Read and understand simple blueprints.
5. Be familiar with bill of materials and project layout.
6. Understand the conservation of materials.
7. Explain the different use of fasteners.

Supplies

Handout: Blueprint of step stool
Safety equipment: glasses, hearing protection
Hand tools for each student: scale, tape measure, square, pencils, chisels, hammer, compass, drill and assortment of bits
Power tools: radial arm saw, table saw, drill press, scroll saw, miter saw, disc sander, belt sander
1"x12"x8' #2 white pine board
8 - 2" drywall screws
Sandpaper
Glue

Safety Issues

- Demonstrate and review all power equipment to be used.
- Show proper operator position on each piece of equipment.
- Demonstrate the use of guards, push sticks, hold downs, etc.
- Identify all main power shut offs.

Activities

1. (45 minutes) Overview of career opportunities in the woodworking industry, cabinetmaking, furniture maker, window and door construction, architectural millwork and veneer plants. Include different job descriptions and wage range.

2. (75 minutes) Demonstrate each machine and hand tool to be used on the project. Emphasize safe use of all tools and safety devices, and give examples of what not to do. Take the time for questions and answers. Allow students to set up machines and review machining operation.

3. (30 minutes) Hand out blueprints of the project: step stool, bird feeder, tool box. Discuss the use of a scale, bill of materials operation, and the selection of materials to be used.

4. (90 minutes) Demonstrate the following and then have students perform activities. Layout rough cut on material, cuts place around defects in material; i.e., knots, splits, stain. Cut material to manageable sizes, check layout to blueprint for proper sizes. Cut all material to finish sizes: width, length, and any angle cuts. Discuss conservation of materials.

5. (60 minutes) Demonstrate the following and then have students perform activities. Layout of holes, circles or arcs on different pieces. Sand or shape edges, drill holes for assembly.

6. (60 minutes) Begin final assembly showing proper sequence for putting parts together. Show use of different fastening systems. Review with students the entire process. Have students complete the projects. Clean up and return tools to proper locations.

Resources

Architectural Woodwork Institute, (1989) Quality Standards Manual, Architectural Woodwork Institute, Arlington, VA.
Blueprints of step stool, bird feeder, tool box.
Freir, J. L., (1977) Cabinetmaking and Millwork, C. A. Bennett Co., Peoria, IL.
Woodworking equipment and lab, MATC, Truax Campus, Room 85, 3550 Anderson Street, Madison, WI.

Section 4: Resources

BEST COPY AVAILABLE

Introduction to the Painting & Decorating Trade

Scope of the Painting & Decorating Apprenticeship Program

In an apprenticeship, unlike many other training programs, a person will earn money while learning a trade. Starting wages are from 40% to 50% of journeyperson wages. Currently journeyperson wages are approximately $16.00 per hour plus benefits. These will vary in different locations. Wages will increase with pre-determined increments established by the Department of Labor in Wisconsin.

The term of apprenticeship is four years with a minimum of 6,240 hours of on-the-job training, with 400 hours of related classroom instruction during the day and 80 hours of night class. Daytime classes are eight hours every other week for which the apprentice is paid as if he or she were working on the job, by the employer.

Scope of the Painting & Decorating Trade

Painting and Decorating is a fascinating trade with a broad area of skills that must be learned and perfected. The apprentice will be able to perform and describe or explain the following areas of the trade at the end of their apprenticeship.

The apprentice will be able to mix or match any color to any given surface. They will also learn about color psychology; that is, how people, in general, will react to different colors. The craftsperson should also be able to suggest to a customer how and where to use certain color schemes.

The apprentice will learn how and where to use the right ladder and/or scaffolding properly and safely. They will be able to identify the proper parts of any ladder and scaffold and most of all, even though they may not be the one setting them up, to spot any dangerous construction or weakness which may endanger their life or that of someone else.

The apprentice will also be able to apply any type of wall covering to any given substrate of surface. Wall coverings are becoming more popular and more types of wall coverings are being developed all the time. Therefore, it is very important that the craftsperson be able to identify the different types of wall coverings and know how to solve the problems in hanging or applying these different materials. The apprentice must also become familiar with the different types of adhesives on the market today for each type of wall covering, whether it is vinyl, silk, cork, carpet, etc. Each needs a different type of adhesive.

by Lothar Langenstroer

Spray painting is another skill which must be learned and perfected. It is also the most economical and efficient way to apply many coatings. Some materials can only be applied by the spray method. This being the case it is very important that the apprentice is able to work with the many types of spray equipment available today. Most of all, they must learn all the rules of safety **and follow them**, since some of this equipment can become dangerous if not properly handled.

In wood finishing, the apprentice will be expected to be able to identify different types of wood. One of the main things to know is the difference between hardwood and softwood, open grain woods and closed grain woods. It is also very important to know how the different types of woods will take or receive the different wood finishing products or materials. There are also various ways of applying these materials to different types of wood surfaces. Some of these methods are applied by spray, brush, roller, cloth, or a combination of these. It is, therefore, very important to know which of these methods would be the best for a specific types of wood or material.

One of the areas which the apprentice and the journeyperson need to keep up with is the different types of special coatings being developed. The craftsperson will be able to select the proper methods of preparing a surface to receive the proper primer, intermediate coat, and finish coats and will also know the physical and chemical makeup and properties of these coatings. One of the most important things to learn about these coatings is the health hazards they present to the craftsperson and the public, and where they can or cannot be used. The student must also be able to identify the different coating problems and how to solve them. The apprentice will also be taught to use the gauges used by inspectors to test these coatings for film thickness, surface profile condition, etc., and also the proper method of application.

In the construction of interior walls today, approximately 85 to 90% of all walls are drywall. Therefore, it is becoming more and more important to know how to finish these surfaces properly. The apprentice must be able to inspect the surface, tape the surface, and finish the joints properly. There are different ways of applying tape and finish coats of drywall cement by hand, automatic tools, or a combination of these. When the apprentice has mastered the preparation of drywall, they must also know the best method of finishing the drywall. Some drywall may be finished smooth or with a variety of textures and the craftsperson has to know how to apply these properly.

Blueprint reading is another area of the trade important to the craftsperson. They must be able to read the different types of drawings on a blueprint and to identify the lines, symbols, and scales. The specifications that come with the print will tell the painter what and how to apply specific materials to certain areas of the building. The combination of these will enable the craftsperson to do the job properly and to picture what the building will look like before it is built.

Abrasive and water blasting is one of the most efficient ways to prepare a surface. It is, therefore, very important that the craftsperson become familiar with the different types of blasting machines available today. Most of these machines need to be handled with extreme care

because they use high pressure to move the abrasive material, water, or steam. That is why it is very important to be familiar with all the safety rules of this type of equipment. It is also important to know the different types of aggregates available and where to use them, whether it is for surface preparation or decorative blasting.

Master craftpersons have used special decorative finishes for centuries. The apprentice will learn the techniques of gilding, glazing, antiquing, wood graining, marbleizing, stenciling, stippling, and texturing. These decorating techniques are becoming more popular again today. The craftsperson who knows these skills will, therefore, be assured a better future in the trade.

Overview of Related Instruction

Related instruction consists of 400 hours which can be completed in six semesters or three years. There are 11 workbooks which the apprentice will complete during this time which consists of daily workbook homework assignments, lectures, demonstrations, hands-on practice, and tests related to the subjects covered in the workbook topics.

The following is a list of the workbooks covered by semester and the broad or global objectives which must be achieved at the end of each subject. Note that in the first semester, the workbook covered is the Basic Manual. This will cover a broad overview of the trade much of which will be covered in greater detail in specific subjects in the semesters to follow.

First Semester

Books covered: Basic Manual

Objectives

First semester apprentices will learn:

1. The history of the painting trade, the Apprenticeship system, and Labor and Management organizations affiliated with the trade.
2. The apprentice's rights and responsibilities.
3. Proper trade terminology.
4. Basic math and standard of measurements.
5. Basic types of materials and their composition and function.
6. Basic types of tools and equipment.
7. Types of ladders and scaffolding used in the trade.
8. Preparation and application procedures for different types of surfaces.
9. Coating and surface failure problems and their solutions and remedies.
10. O.S.H.A. and general safety.
11. Basic understanding of color and light.

First semester covers the basics of the trade. The next five semesters will cover each individual subject in detail.

Second Semester

Books covered: Ladder & Scaffolding, Color Mixing & Matching

Objectives

Second semester apprentices will learn:

1. The types of ladders, scaffolding, riggings, and accessories used in the painting trade.
2. How to safely use this equipment and know the limitations.
3. What is color.
4. Color psychology and optical illusions.
5. Color harmonies.
6. Type of materials used in color mixing.
7. How to mix and match colors.

Third Semester

Books covered: Wallcoverings, Spray Painting

Objectives

Third semester apprentices will learn:

1. Methods of surface preparation for old and new surfaces before wallcoverings can be applied.
2. Tools and equipment used in wallcovering application.
3. Types of adhesives available for wallcoverings.
4. What types of wallcoverings are available today and what are their special characteristics.
5. How to lay out rooms or walls for estimating and hanging wallcoverings.
6. Different techniques used in trimming, cutting, pasting, and applying wallcoverings.
7. What types of spray equipment are used by the painting and decorating craftsperson.
8. How the different types of spray equipment work.
9. How to operate all types of spray equipment properly and safely.
10. How to perform basic maintenance on spray equipment.

Fourth Semester

Books covered: Woodfinishing, Special Coatings

Objectives

Fourth semester apprentices will learn:

1. Types of woods that are used in construction or buildings and their characteristics.
2. Different ways to finish different types of wood.
3. Perform maintenance work on existing woodwork.
4. Type of wood finishing materials on the market today and how to use them correctly and safely.

5. What is corrosion and how can it be prevented or stopped.
6. Proper surface preparation for different substrates.
7. What types of special coatings are used today and what are their properties, characteristics, and limitations.
8. What safety precautions must be observed when working with these coatings and why.

Fifth Semester

Books covered: Blueprint Reading, Abrasive & Water Blasting

Objectives

Fifth semester apprentices will learn:

1. What type of equipment is used for abrasive and waterblasting, powerwashing, and steam cleaning.
2. How is this equipment used to perform surface preparation, maintenance work, and decorative work.
3. What type of abrasives and other materials are used with this equipment.
4. How to properly and safely set up, use, and perform maintenance work on this equipment.
5. What are the O.S.H.A. safety rules that must be observed in using this equipment.
6. What is contained in a set of blueprints, specifications, and schedules.
7. How to read and use blueprints, specifications, and schedules.
8. How to estimate labor and materials from blueprints.

Sixth Semester

Books covered: Special Decorative Finishes, Drywall Taping & Finishing

Objectives

Sixth semester apprentices will learn:

1. What types of automatic and hand tools are used to tape and finish drywall.
2. What types of materials are used to patch, prefill, tape, and finish drywall.
3. How to properly inspect, prefill, tape, and finish wallboards using hand and automatic drywall tools.
4. Texture walls and ceilings using hand as well as machine texturing methods.
5. How to glaze, antique, and stipple different surfaces.
6. How to woodgrain and marbleize different surfaces.
7. How to perform different gilding techniques.
8. How to design, make, and use stencils on different surfaces.

Introduction to Arc Welding

Arc welding (also called SMAW or shielded metal arc welding) consists of an electrical power supply, a ground connection and an electrode holder. The ground connection is attached to the metal to be welded. A specially coated rod of metal (the electrode) is placed in the electrode holder. When the welding power supply is turned on and the electrode tip is lightly touched to the grounded metal surface, an electric arc is generated.

When the tip of the electrode is held the correct distance from the base metal, the arc will produce enough heat (electrical resistance) to both melt the base metal and melt the electrode. At optimum distance and optimum heat (amperage setting), a weld is created. Done properly, the strength of this weld will equal or exceed the strength of the original material.

Arc welding produces strong welds quickly. It takes much less time to perform an arc weld than it does to perform an oxy-acetylene weld. However, most welders have found it easier to learn how to make a good arc weld if they have first mastered oxy-acetylene welding. For thicker metals (¼ inch and up), arc welding would definitely be preferred over gas welding because it takes a very long time to preheat the metal before one can gas weld it together.

The coating on the electrode has 11 different functions, the main two being: (1) to create a gaseous envelope which protects the molten metal from the atmospheric gases (oxygen and nitrogen) which could inhibit weld strength and (2) to create a glass-like slag which covers the weld and protects it as it cools. The slag is chipped off after the weld has cooled. When molten, the slag can actually "scavenge" contaminants from the molten weld metal before it cools.

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by Valerie Weihman, printed with permission of author.

Set Up for Arc Welding

Open the lower panel on the front of the machine by turning the slotted knob with a fingernail or coin. Life this panel up. There are two threaded copper rods used as electrical connections. Use a crescent wrench to loosen or tighten the connections. Do not use pliers or vise grips as these will destroy the connections.

AC (Alternating Current) When using AC current, it does not matter which cable is attached to which connection. Turn the large switch on the front of the machine to AC.

DCRP (Direct Current-Reverse Polarity) This is also called DCEP or Direct Current-Electrode Positive. Attach the electrode cable to the red or positive connection. Attach the ground cable to the black or negative connection. Tighten the connections. Turn the large switch on the front of the machine to CC or constant current.

DCSP (Direct Current-Straight Polarity) This is also called DCEN or Direct Current-Electrode Negative. Attach the electrode cable to the black or negative connection. Attach the ground cable to the red or positive connection. Tighten the connections. Turn the large switch on the front to CC or constant current.

How to Decide Which Current to Use? AC? DCRP? DCSP?

The way in which the electrode holder and the ground cable are attached to the machine and the machine setting determine the polarity. Polarity indicates the direction in which the electrons flow in electrical welding processes. By changing the polarity, the location of heat concentration can be changed. Some electrodes are designed to work with only one kind of polarity.

Electrons flow from negative to positive (and ions flow in the opposite direction). On most machines, there will be plug-ins or connections labeled + and -. On other machines, a color code is used. Red is positive and black is negative. Polarity is determined by which cable is on the positive connection and which cable is on the negative connection.

DCSP gives the deepest penetration (melts deep into the metal) for the majority of electrodes. Electron flow is from the electrode to the base metal. In other words, the electrode is negative and the ground metal is positive. When DCSP is used with an electrode that is able to work on any polarity, deep penetration is achieved. About one-third of the total heat generated will be at the electrode, but two-thirds of the heat is at the base metal (metal welded).

DCRP penetrates less deeply into the base metal for the majority of electrodes. Electron flow is from the base metal to the electrode. In other words, the electrode is positive and the ground connection is negative. One-third of the total heat generated is at the base metal; two-thirds of the heat is at the electrode tip. This is good for out-of-position

welding. Out-of-position means that the metal to be welded is not on a flat, horizontal plane. The types of out-of-position welding are: overhead, vertical, and horizontal "wall" position. Gravity pulling on the liquid metal puddle makes out-of-position welding difficult. DCRP gives a less fluid molten puddle of metal, which makes it easier to control in out-of-position welding.
DCRP is considered to have the best "cleaning action" of any polar. Any rust on the surface is broken through by the ions bombarding the surface.

DCRP is also very good on thin metals.

One exception in DCRP is the E6010 electrode. It is designed to work only on the DCRP setting. And, being an exception to the rule, it is the deepest penetrating of all the electrodes. It also has no color dot on the electrode. Use only DSRP with this electrode.

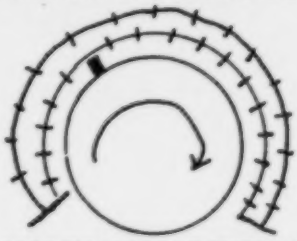
AC Alternating current means just that - the current alternates. The electrons flow for a short period in one direction and then switch flow in the other direction. The switching back and forth follow a regular cycle. so really, there is a combination of the qualities of DCRP and DCSP in one setting. Advantages of AC include some of the cleaning action of the DCRP setting and the deep penetration of DCSP.

DCSP has a narrow width weld bead and the weld penetrates down deep into the base metal. DCRP has a wider weld bead, but a shallower weld. A weld done with AC would appear to be half way between the two.

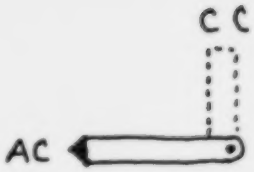
ARC Welding Set Up

The controls on the front of the machine should be set as follows:

ARC ADJUSTMENT
(fine adjustment)



VOLT/AMP ADJUSTMENT
(read outer ring for amp)

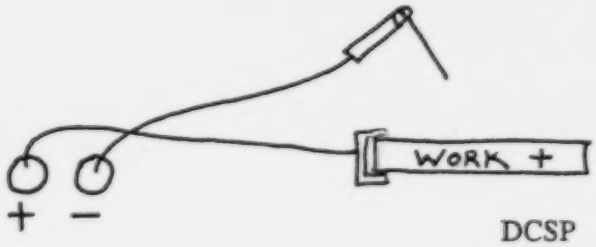


SET FOR CC OR AC
CC=constant current
use for DCSP or DCRP

CONTACTOR
Panel
⇧
Remote

REMOTE ARC ADJUSTMENT
Panel
⇧
Remote

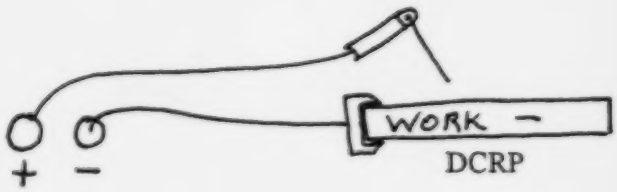
DCSP Direct Current-Straight Polarity
Most electrodes: 1/3 heat at electrode,
2/3 heat at base metal



DCSP

arrows indicate electron flow
arrows indicate electron flow

DCRP Direct Current-Reverse Polarity
Most electrodes: 2/3 heat at electrode,
1/3 heat at base metal



DCRP

AC Alternating Current - does not matter with cable is attached to which connection.
Has ½ of heat at electrode, ½ at the base metal.

DCSP DCRP AC

A Comparison of the penetration with different currents.

How to Arc Weld

Choose electrode size, type, and amperage range needed in relationship to the metal to be welded.

Choose polarity (DCSP, DCRP, or AC - see "Set Up for Arc Welding") and connect the electrode and ground cables accordingly.

Connect the ground cable securely to the work or to the metal table that the work is placed on.

Turn on the ventilation. Check that you will not be positioned between the "suction-type" ventilation and the work.

Obtain the proper shield lens and check it for cracks or pits. A "gold-bond" lens should be checked for scratches in the gold layer.

Check that the electrode holder is not in contact with the grounded metal. Hanging it on a wall hook is a good idea.

Turn on the electrical power box on the wall. Turn on the "on" switch on the welding machine.

At this point, an electrical arc will be started whenever an electrode in the holder comes in contact with the grounded metal surfaces. Be aware of where you point the electrode. Assume the machine is always on.

Insert the bare end of the electrode into one of the pairs of grooves in the electrode holder.

Position the electrode tip about 2" above the metal to be welded. You will not be able to see where the electrode is until the arc is started when you have your helmet down. Try to get a feel for where the electrode is in relation to the metal. Some people find it helpful to practice with the machine off.

Lower your helmet and swing the electrode tip down with a twist of the wrist. Scratch the surface of the metal. It is similar to striking a match.

If the electrode sticks to the metal, wiggle it back and forth to break it loose. if the electrode doesn't break off of the metal, squeeze the handle on the electrode holder to open the jaws and release the electrode. It is important to do this quickly or it can overheat the electrical relays within the machine.

After scratching the metal with one smooth motion, you should have an arc and should be able to clearly see where the electrode is pointing.

Adjust the angle of the electrode to 12-20 degrees off of the vertical forward (see illustration). The distance from the electrode tip to the metal should equal the diameter of the electrode metal

core. It can vary as much as two times the diameter to half of the diameter.

Move along the metal in a relatively slow motion. The electrode is pointed 12-20 degrees towards the weld. You back away from the weld.

Most welders use a slight side-to-side motion weave. The ripples in the finished weld, however, are not created by this motion, but by the back side of the molten puddle cooling as you move along.

You will find as you weld that you need to continually watch that you keep the electrode height and angle consistent.

Move your body rather than twist your wrist to move along the metal. Otherwise, the angle of the electrode will continually be changing.

To stop the arc, just pull the electrode away from the metal. Don't melt the electrode down shorter than 2" or the first stamped numbers on the electrode.

The electrode stubs will be hot. One practice is to drop the electrode from the holder onto the floor and nudge it under the table with your boot. Then clean them all up at the end of the work period.

ARC Welding Tips

When performing an arc weld, try to keep an eye on the back side of the puddle, not the arc. Adjust your speed, motion, angle, and height so the back side of the molten puddle maintains a consistent shape and height as you move along the area to be welded.

Most welders weld horizontally in front of themselves so they are best able to see the weld puddle. (It is about the same angle as if you were writing on a piece of paper.)

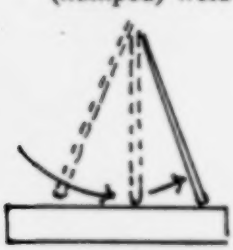
The two most common mistakes are: (1) too high of an arc, and (2) too fast. (If the slag is really difficult to chip off, check these two things.)

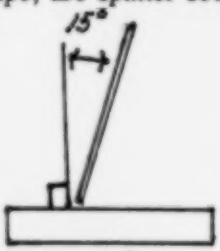
The amperage setting depends upon the thickness of the metal, the mass of the metal (size), the diameter of the electrode, the type of the electrode, the polarity, length of the electrode cable and the ground cable, temperature of the metal to be welded and the size of the object that your ground cable is attached to (table or object). To aid in decision making a range of amperage settings to be used is given in texts and on charts. To determine the correct amperage to be used, do a few welds on scrap metal. Even welders with many years of experience will do a practice weld first to set up the machine properly.

Too low of an amperage setting is indicated by: electrode sticking, arc being hard to start, and the weld looking high and narrow like a caterpillar.

Too high an amperage setting is indicated by: weld puddle is elongated; weld puddle is pointy at the back side; slag is very hard to chip off; weld is concave (below the original surface of the metal); holes are melted through the metal; electrode turns bright red along its length, and coating burns off the electrode.

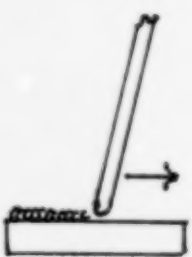
Correct amperage setting is indicated by: weld puddle having an elliptical shape, slightly convex (humped) weld shape, arc spatter sounding like bacon frying.

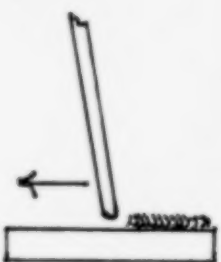

scratch to start arc

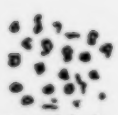


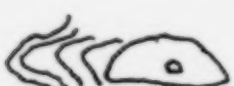
arc angle

distance from metal

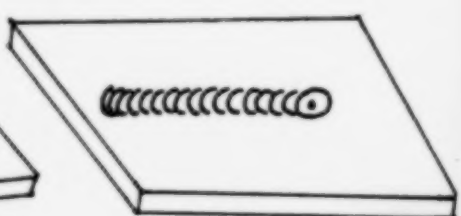

right hand


left hand

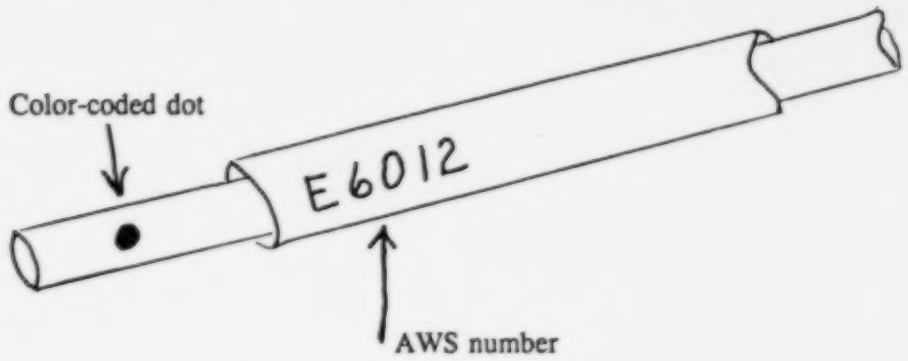

too high an arc length


too high amperage

too low amperage (looks like a caterpillar)


correct

Each electrode has either a color-coded dot or its AWS number written on it.



To interpret the AWS numbers:
The "E" represents an electric arc electrode.
A "G" would represent a gas welding rod.

The first two digits represent the tensile strength.
(e.g. E**60**xx has a minimum tensile strength of 60,000 psi.)

The third digit tells the position the arc can be used.
1. all positions
2. horizontal and flat only
3. flat position only

The fourth digit tells the flux coating and current to be used.
1. Cellulose potassium - all types of current
2. Titania sodium - AC or DCSP (not DCRP)
3. Titania potassium - all types of current
4. Iron powder titania - all types of current
5. Low hydrogen sodium - only DCRP
6. Low hydrogen potassium - only AC or DCRP
7. Iron powder iron oxide - AC or DCSP
8. Iron powder, low hydrogen - all types of current

Arc Welding Electrodes

Number	Color	Position	Current	Uses and Comments
E6010	None	All	DCRP	The deepest penetrating of all electrodes.
E6011	Blue	All	AC or DCRP	Good penetration with a more stable arc than the E6010.
E6012	White	All	AC or DCSP	Used in production, good for poorly fitted joints, little splatter.
E6013	Brown	All	AC or DCSP	Used for sheet metal and fillets, good for low current applications, easily maintained arc, useful with small electrode, good for low volts.
E6015	Red	All	DCSP	A low hydrogen electrode, used for low carbon, steels, weld materials files and machines easily.
E6016	Orange	All	AC or DCSP	Same as E6015, but has a more stable arc.
E6020	Green	Flat & Horizontal	AC or DCSP	Good for all fillets weld.
E6026		Flat & Horizontal	All types	A low hydrogen electrode, for low carbon steels, good for flat & horizontal fillet welds.
E7014		Flat & Horizontal	All types	An iron powder electrode, good for fillets, also called a drag rod.
E7018	Orange	All	All types	Allow hydrogen, iron powder rod that dispels cracking in dissimilar metals.
E7024	Yellow	Flat & Horizontal	All types	Most popular electrode in world, an iron powder rod that is good for poor fit-ups.
E8018		All	All types	A low hydrogen, iron powder, alloy rod with high tensile strength.

MIG welding stands for Metal Inert Gas. It is the most common shop name for the process. Its official title is GMAW or Gas Metal Arc Welding.

MIG welding is similar to ARC welding except for two main differences: Instead of an electrode which must be replaced frequently, the electrode for MIG welding is a spool of fine wire. The wire is presented to the weld site by an adjustable speed motor. The other difference between MIG and ARC welding is that a shielding gas is usually used instead of an electrode coating to protect the molten puddle of metal from atmospheric contamination. Some MIG welders, however, have the coating material on the inside of the wire and these are called FCAW (flux-core-arc-weld).

MIG welding is always done with DCRP. To properly hook up the MIG welder, the wire-feed gun must be attached to the positive connection (red) and the ground cable attached to the negative (black). This puts tremendous heat at the end of the wire, allowing it to burn forcibly down into the base metal. The shield gas is adjusted by volume (cubic feet per hour) rather than by pressure (pounds per square inch). There should be enough shield gas to keep the weld puddle, wire, and torch nozzle flooded with shield gas at all times that the arc is maintained.

How to Set Up the MIG Welder

Obtain the "Spool-matic" gun and cables.

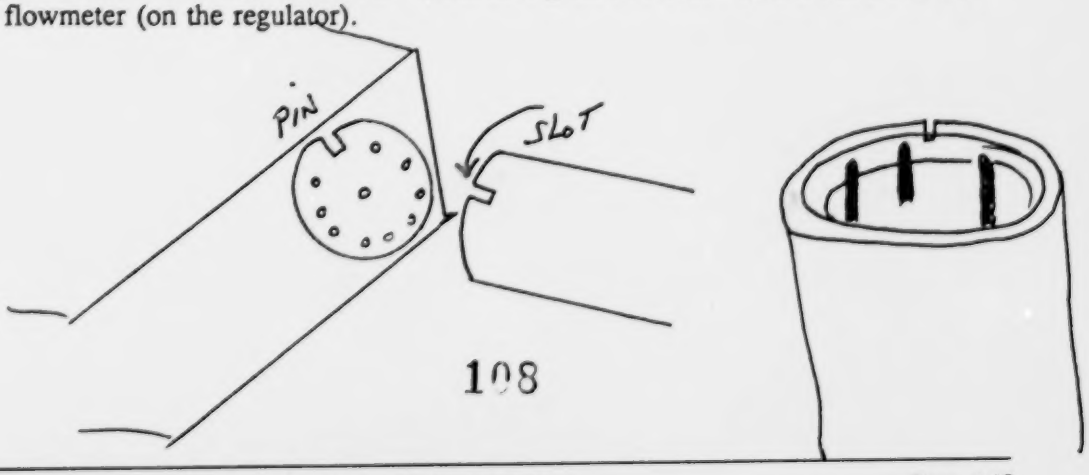
Open the lower panel on the Miller power supply.

Disconnect the lug on the red connection (+), using a crescent wrench. Attach the lug-end cable of the "spool-matic". Tighten the connection using a crescent wrench.

Attach the ground cable to the black connection (-). It is the same one that was used for ARC welding.

Another of the cable attachments for the "spool-matic" is round and has three interior pins. It is important to first identify the alignment mark before attaching the cable. By looking at the receptacle on the machine, you can see how to align this fitting. Once it is plugged in, twist the sleeve of the plug to the right until it is snug.

The remaining cable attachment has a threaded brass fitting on the end. This connects to the bottom of the flowmeter (on the regulator).



How to Attach the Shield Gas Cylinder

Argon, helium or CO_2 may be used for shielding gases in MIG welding. There are also specialty gas combinations. CO_2 can only be used for steel.

Chain the cylinder. Remove the cap on the valve stem.

Take a hold of the neck of the cylinder. Crack the valve. This means, open it up to let a burst of gas out. This cleans out any debris that might get into the regulator. It is an essential step. Close the valve.

Support the regulator-flowmeter device and hand-thread it onto the cylinder opening. It should go on easily. If it doesn't, take it off and try again. Don't force it, since it is a brass fitting, you can strip the threads easily.

Using a crescent wrench (not pliers, vise grip or pipe wrench), tighten the fitting. Do not use a hammer or pipe to over-tighten.

The flowmeter (tube with measurements) should be vertical. If not, reattach it so the measurements correspond to the gas being used.

Attach the "spool-matic" gas hose to the bottom of the flowmeter. Tighten with a crescent wrench.

Open the cylinder value stem slowly, just a crack. Then open it all the way until you feel it stop.

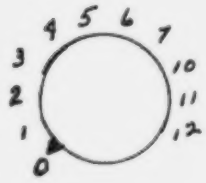
Turn on the machine.

Holding the "spool-matic" gun away from any grounded surface, pull the trigger just a short way. If the wire is coming out, you are pulling the trigger too far back. Look at the flowmeter while you are pulling the trigger.

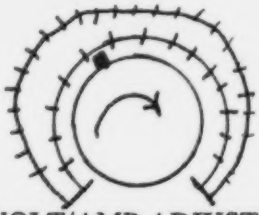
Twist the knob on the top of the flowmeter tube until the red ball floats at the correct c.f.h. (cubic feet per hour) setting. The setting will vary with the type of gas and the size of gun nozzle tip. Although opinions vary, it is best to read at the center of the ball.

Turn off the machine and go to the other adjustments.

The controls on the front of the machine should be set as follows:



ARC ADJUSTMENT
(must be set at zero for MIG)



VOLT/AMP ADJUSTMENT
(read inner ring-voltage)

SET AT CV
(constant voltage for MIG)

CONTACTOR
Panel
Remote

REMOTE ARC ADJUSTMENT
Panel
Remote

When you set up the machine for MIG welding, double check the following:

- Adjust for voltage, not amperage. There are three different rings of measurement to read. Check that you have the right one.
- It is important that the contactor switch is set on remote so the trigger on the gun is able to work. If set on panel, the arc will be initiated in the same way as for ARC, by touching the tip if the wire to any grounded surface.
- CV or Constant Voltage (Constant Potential) is the only setting that can be used for MIG welding.
- The arc adjustment dial should be set at zero for MIG.
- Before welding, double check the gas flow.

Safety Rules for Arc and MIG Welding

- Do not look at the arc. Caution others in the room not to look at the arc. Weld behind the welding curtain.

- Give a cautionary signal "cover up" to people near you before striking an arc.

- Wear a welding helmet with the proper shade of lens. Do not use gas welding goggles or lens, they are not dark enough.

- Check the lens for cracks by looking through it up to the lights in the room. You should not be able to see any bright spots of light.

- Cover all skin to protect yourself from the ultraviolet rays emitted during the welding process. The ultraviolet rays can cause severe burns, much like an extreme sunburn. Especially check your neckline and wrists to make sure you're covered.

- Wear a fume mask (like the ones used in UW-Madison foundry) for metal fumes.

- Turn on the ventilation system. Position the fume hood over the work so it is in front of you, not behind you. However, if the fume hood is positioned too closely to the work, it can suck away the shield gas (MIG) or gaseous envelope (ARC) which will cause pinholes in the weld.

- Do not weld on a closed container or on one which has held fuel. It may explode due to the heat causing an increase in pressure in the vessel.

- Remove all combustibles (flammables) from the area before working.

- Wear natural fabrics, not synthetic. Many synthetic fabrics (nylon, polyester, acetates) will ignite, burn, or melt.

- Empty your pockets of any flammables, especially: butane lighters, matches, pens, cigarettes, combs. Button your pockets. Better yet, have a shirt or jacket having no pockets.

- If your pants have cuffs, roll them inside. Sparks and hot slag can get trapped in them, starting on fire. If you smell something burning, it is usually you!

- Do not use the equipment unless you have been trained on it. If you are not sure about some aspect of operation, think, read handouts, or ask someone who is knowledgeable, but do not experiment (you may damage yourself or the machine).

- Use the "buddy-system". There should be two people in the room whenever you weld. Do not weld with electrical equipment by yourself.

- Keep hands away from the end of the MIG wire feeder. Do not put your hands in between the gun and the grounded surface.

- Assume all metal in the shop is hot. Test with a quick touch first. Don't pick up any metal before testing it first.

- Do not weld with cables neatly coiled. Lay them out on the floor. When coiled, they can set up a magnetic field which requires you to use more amperage than necessary and causes other problems. (It is called an induced magnetic field.)

- Inspect the cables before using. There should be no cracks in the insulation. There should be no electrical tape repairs.

- Do not weld if the floor is wet. You can become a better ground than the grounded metal surface causing electrical shock.

- Keep the machine protected from sparks, slag, grinding dust, and other debris.

- Partially used electrodes should be removed from the electrode holders when not in use.

- Avoid wearing low-cut footwear, sandals, or synthetic material footwear.

- Do not wear rings, watches, or other jewelry.

- Never weld directly on concrete (other than explosion-proof concrete) as the heat can cause it to expand with explosive force.

- Turn off the machine when not in use.

- Do not wear frayed or worn-out clothing as it catches fire easily.

Resources for Math, Math Applications, and Mechanical Reasoning

A big advantage of Tools for Tomorrow is participants have the opportunity to get to know their peers quite well because they spend approximately 96 hours together. There are many opportunities for "connectedness" both with each other and to their experiences. This period of time can provide an excellent opportunity for practice and support of math skills, math applications, and mechanical reasoning in an integrative manner.

According to an article in the Journal of Education by Dorothy Buerk of Ithaca College, women are looking for a handhold to understanding math. Math is not and can not be an absolute; it is intuitive, contextual, and historical. (Buerk, 1985, pp. 62-63). The Tools for Tomorrow program gives women an occasion to "make meaning" of their experiences. Their math experience at this time can be one of success, especially when practical applications of math are stressed. With practice, learners will begin to detect their common errors in mathematics, and, more importantly, to experience success in reasoning and problem solving.

Instructors can have a big effect on a student's math learning by facilitating problem solving. Ms. Buerk encourages teachers to "provide time to experience and clarify a problem (situation) before focusing on a solution.... Answer questions with questions that both clarify the students' questions and that help the students realize their own potential as problem solvers and problems posers." (Buerk, 1986, p. 69). It is easy to want to rush along learning, but a person can only build upon her current understanding and may need clarification and practice before she moves on. Buerk also encourages students to participate in journal writing which often gives students the opportunity to reflect, infer, and integrate.

Currently, Tools for Tomorrow does not have a math class component. Participants are encouraged to attend Adult Basic Education classes or learning centers to receive support in their math learning. Ideally, the Tools for Tomorrow program would have a math and mechanical reasoning manual to accompany the lessons as well as a math class or small group study sessions to support the participants in their exploration and learning.

On the next page is a bibliography of resources for math skills, math applications, and mechanical reasoning. Some resources are better than others in providing practical applications in math. An instructor can be an important bridge in helping students connect experience and the math information contained within these resources.

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Resources for Math, Math Applications, and Mechanical Reasoning

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Booth, S., (1991), Bridges to Equity Participant's Workbook, City of Toronto, Toronto, Canada.

Center on Education and Work, (1992) Career Planning Curriculum for Adults, Center on Education and Work, Madison, WI.

Division of Vocational and Career Education, (1991) ONOW Curriculum, Orientation to Nontraditional Occupations for Women, Ohio Department of Education, Columbus, OH.

Grey, M., (1991) Women's Resources, A Curriculum in Empowerment for Tradeswomen, Northern New England Tradeswomen, St. Johnsbury, VT.

Hammer, W., (1989) Blueprint Reading Basics, Industrial Press, New York, NY.

Kreutz, E., (1992) In for a Change, Chicago Women in the Trades, Chicago, IL.

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Section 5: Course Outlines

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Madison Area Technical College
Tools for Tomorrow
Course Outline

Module: Orientation
Unit: Orientation

Class hours: 3

Competencies	Learning Activities	Resources
O.1.1 Recognize main components of the Tools for Tomorrow Program.	Lecture and discussion.	"Tools for Tomorrow" pamphlet. "Tools for Tomorrow: Women in the Trades Pre-Apprenticeship Program Calendar".
O.1.2 Identify benefits (financial and personal) of pursuing nontraditional work as compared to traditional women's work.	Lecture and discussion.	Women in the Workforce Quiz developed from information received from the National Commission on Working Women, Wisconsin's Women's Council, Wisconsin Bureau of Apprenticeship Standards, Madison, WI. Van Bramer, P. and Redsten D. (1993) Follow-up Study of 1992 Graduates, Madison Area Technical College, Madison, WI.
O.1.3 Explain some of the entry methods and expectations of the apprenticeship system.	Lecture, video, and discussion.	Wisconsin Department of Industry, Labor and Human Relations, A Guide to Apprenticeship in Wisconsin, Madison, WI. Wisconsin Bureau of Apprenticeship Standards, U. S. Bureau of Apprenticeship and Training, and Madison Area Technical College (1992) Apprentice Application Information, Madison, WI. Women Make Movies, Inc. (1989) Trade Secrets, New York, NY.
O.1.4 Identify nontraditional training options in the vocational technical system. Describe nontraditional occupations in the construction and industrial trades.	Lecture and discussion.	Madison Area Technical College, (1993) MATC Catalog, 1993-94, Madison, WI.
O.1 5 Describe how affirmative action affects the hiring of women in construction trades.	Lecture and discussion.	
O.1.6 Identify supportive services and community resources for childcare and transportation.	Lecture and discussion.	

Competencies	Learning Activities	Resources
O.1.7 Identify supportive services and community resources available to Tools for Tomorrow participants for personal growth.	Lecture and discussion.	Employment Options, Inc. Workshops, Classes, and Support Groups at Employment Options, Inc., Madison, WI.
O.1.8 Identify some of the math skills required for nontraditional work and entry into the Tools for Tomorrow program.	Lecture and discussion.	"MATC Adult Basic Education" pamphlet.
O.1.9 Identify the Tools for Tomorrow application and acceptance process.	Lecture and discussion.	Maps of locations for MATC Truax and Commercial Avenue campuses. Application forms for Tools for Tomorrow.

Madison Area Technical College
Tools for Tomorrow
Course Outline

Module: Program Introduction
Unit: Program Introduction

Class hours: 3

Competencies	Learning Activities	Resources
PI.1.1 Describe the program goals and classroom procedures.	Lecture and discussion.	Madison Area Mechanical Contractors Association (1991) Journey Into Tomorrow: Career Opportunities in the Mechanical Construction Trades, Madison, WI. Madison Area Technical College (1993) MATC Catalog, 1993-94, Madison, WI. U. S. Department of Labor, Employment and Training Administration, Bureau of Apprenticeship Standards (1992) Apprenticeship, Washington, DC. Wisconsin Bureau of Apprenticeship Standards, Department of Industry, Labor and Human Relations and U. S. Bureau of Apprenticeship and Training, Department of Labor, Employment and Training Administration (1992) "Apprenticeship Application Information", Madison, WI. Wisconsin Bureau of Apprenticeship Standards, Department of Industry, Labor and Human Relations, (1988) "Apprentice Indenture Sample", Madison, WI. Wisconsin Bureau of Apprenticeship Standards (ibid.), "How to Become An Apprentice". Wisconsin Bureau of Apprenticeship Standards (ibid.), "Introduction to Apprenticeship". Wisconsin Bureau of Apprenticeship Standards (ibid.), "Madison Area Sheet Metal JAC Exhibit A Sample".
PI.1.2 Identify available support services.	Lecture and discussion.	

Madison Area Technical College
Tools for Tomorrow
Course Outline

Module: Apprenticeship System
Unit: Apprenticeship System

Class hours: 1½

Competencies	Learning Activities	Resources
A.1.1 Describe the apprenticeship training process including commonly used terms and concepts.	Lecture and discussion.	Wisconsin Bureau of Apprenticeship Standards, Department of Industry, Labor and Human Relations and U. S. Bureau of Apprenticeship and Training, Department of Labor, Employment and Training Administration (1992) "Apprenticeship Application Information", Madison, WI. Wisconsin Bureau of Apprenticeship Standards, Department of Industry, Labor and Human Relations, (1988) "Apprentice Indenture Sample", Madison, WI.
A.1.2 Describe the apprenticeship system and the roles of the Wisconsin Bureau of Apprenticeship Standards and the U.S. Bureau of Apprenticeship and Training as registration agencies, private industry, labor, and the Wisconsin Vocational, Technical and Adult Education system.	Lecture and discussion.	Madison Area Technical College, (1993) MATC Catalog 1993-94, Madison, WI. Wisconsin Bureau of Apprenticeship Standards (ibid.). Wisconsin Bureau of Apprenticeship Standards (ibid.), "How to Become an Apprentice". Wisconsin Bureau of Apprenticeship Standards (ibid.), "Introduction to Apprenticeship". U. S. Department of Labor, Employment and Training Administration, Bureau of Apprenticeship Standards (1992), Apprenticeship, Washington, DC.
A.1.3 Describe the basic qualifications, selection procedures, and working conditions for one local apprenticeship program.	Lecture and discussion.	Madison Area Mechanical Contractors Association (1991) Journey Into Tomorrow: Career Opportunities in the Mechanical Construction Trades, Madison, WI. Wisconsin Bureau of Apprenticeship Standards (ibid.), "Madison Area Sheet Metal JAC Exhibit A Sample".

Madison Area Technical College
Tools for Tomorrow
Course Outline

Module: Communicating on-the-Job
Unit: Communicating on-the-Job

Class hours: 6

Competencies	Learning Activities	Resources
CJ.1.1 Identify at least four nonverbal methods to develop rapport or trust with another individual.	Group Exercise: Nonverbal pacing. Lecture and discussion.	
CJ.1.2 Describe what is meant by "active listening" and demonstrate the concepts involved within given practical situations.	Lecture. Exercise: Active Listening. Discussion.	
CJ.1.3 Distinguish among passive, aggressive, passive/aggressive, and assertive methods of communication.	Lecture and discussion.	Center on Education and Work, (1992) Career Planning Curriculum, University of Wisconsin, Madison, WI. *Alberti & Emmons (1974) "Assertiveness Inventory" from Your Perfect Right, Impact Publishers, San Luis Obispo, CA.
CJ.1.4 Assess personal level of assertiveness in specific situations.	Exercise: Assertiveness Inventory.	Alberti & Emmons (ibid.).
CJ.1.5 Define what is meant by "assertive expression" and "assertive listening" and practice combining the two in specific situations.	Lecture. Role plays.	Role play suggestions based on actual situations.
CJ.1.6 Identify at least two assertive strategies to deal with criticism and apply to practical situations.	Lecture and discussion. Written exercise.	*McKay, Davis & Fanning (1983) "Strategies for Responding to Criticism" from Messages: The Communications Book, New Harbinger Publications, Oakland, CA.
CJ.1.7 Specifically discuss how anger might be handled in constructive ways.	Group interaction/discussion.	*Alberti & Emmons (ibid.) "Constructive Ways to Handle Criticism".
CJ.1.8 Discuss and practice how conflict might be constructively resolved.	Lecture and discussion.	

Competencies	Learning Activities	Resources
CJ.1.9 Discuss how a women, working in a nontraditional field area, might "talk with the guys", handle put-downs, and assertive aggression that could be experienced.	Discussion and possibly some lecture.	*Rawlings, E., (1977) "Basic Human Rights" from Psychotherapy for Women, Treatment Toward Equality, Charles Thomas Company.
CJ.1.10 Identify specific behaviors that are indicative of sexual harassment.	Exercise: Card/questions. Discussion.	Index cards.
CJ.1.11 Discuss the effects of sexual harassment on an individual.	Exercise: Card/questions. Discussion.	
CJ.1.12 State the legal definition of sexual harassment.	Lecture.	Wisconsin Department of Industry, Labor and Human Relations, Equal Rights Division, "Harassment Under Wisconsin's Fair Labor Law" reprint, Madison, WI. *Massachusetts Department of Education, "Questionnaire on Sexual Harassment" from Who's Hurt and Who's Liable. Sexual Harassment in Massachusetts Schools: A Curriculum Guide for School Personnel.
CJ.1.13 Identify preventive measures for sexual harassment and practice strategies given practical situations.	Lecture and discussion. Role plays.	Scenarios (case studies for students to role play). *Gullickson, J., Sexual Harassment: Taking Control of the Situation, St. Paul, MN.
CJ.1.14 Identify and describe specific steps to take if an individual is being sexually harassed.	Lecture and discussion.	

*reprinted with permission in the Career Planning Curriculum, University of Wisconsin, Madison, WI, 1992.

Madison Area Technical College
Tools for Tomorrow
Course Outline

Module: Employer and Apprenticeship Coordinator Panel — Class hours: 3
Unit: Employer and Apprenticeship Coordinator Panel

Competencies	Learning Activities	Resources
EA1.1 Describe employment opportunities, qualifications, and application procedures for one employer or apprenticeship trade represented.	Panel presentation and discussion.	Employers in construction and industrial trades, and apprenticeship coordinators.
EA1.2 Describe one employer's or apprenticeship coordinator's expectations of an employee or apprentice.	Panel presentation and discussion.	Employers in construction and industrial trades, and apprenticeship coordinators.

Madison Area Technical College
Tools for Tomorrow
Course Outline

Module: Hand Tool Use
Unit: Hand Tool Use

Class hours: 3

Competencies	Learning Activities	Resources
H.1.1 Identify the name and function of a variety of hand tools.	Demonstration and practice.	McCormick, D., (1987) Housemending, E. D. Dutton, New York, NY. Wagner, W., (1987) Modern Carpentry, Good Heart Willcox Co., Inc., Chicago, IL.
H.1.2 Describe the safe use of several hand tools.	Lecture, discussion, demonstration, and practice.	Kreutz, E., (1991) Chicago Women in the Trades Curriculum Guide for Pre-Apprenticeship Training, Chicago, IL.
H.1.3 Describe how to safely carry lumber/plywood.	Discussion, demonstration, and practice.	Kreutz, E. (ibid.).

Madison Area Technical College
Tools for Tomorrow
Course Outline

Module: Job Search Skills — Class hours: 3
Unit: Job Search Skills

Competencies	Learning Activities	Resources
J.1.1 Describe the contents and uses of a job hunting folder.	Lecture and discussion.	Clements, K., (1993) "Job Hunting Folder Checklist", Tools for Tomorrow: Women in the Trades Trainer's Guide, Madison Area Technical College, Madison, WI.
J.1.2 Describe the significance of good references.	Lecture and discussion.	Center on Education and Work, (1992) Career Planning Curriculum, University of Wisconsin, Madison, WI.
J.1.3 Describe the importance of completing a job application accurately and neatly.	Lecture, discussion, and demonstration.	
J.1.4 Describe the information contained in a resume.	Lecture and discussion.	Wisconsin Career Information Service, (1992) Going to Work, Wisconsin Career Information Service, Madison, WI. Clements, K., (ibid.), "The Resume". Clements, K., (ibid.), "Resume Work Sheet". Clements, K., (ibid.), "Resume Writing Action Words". Clements, K., (ibid.), "Sample Resumes".
J.1.5 Explain the important parts of a letter of application.		Clements, K., (ibid.), "Format of a Sample Letter to Employer".
J.1.6 Identify some positive behaviors in an interview session.		Clements, K., (ibid.), "Possible Questions to Ask in an Interview".
J.1.7 Describe how a rating system is used in an interview session for apprenticeships.		U. S. Department of Labor - Bureau of Apprenticeship and Training, A Guide for the Interview Session, Pipe Trades Apprenticeship Form #3, Washington, DC.
J.1.8 Describe the set up and use of a job lead file.		Clements, K., (ibid.), "Job Lead File".

Madison Area Technical College
Tools for Tomorrow
Course Outline

Module: Physical Conditioning
Unit 1: Ergonomics

Class hours: 3

Competencies	Learning Activities	Resources
PC.1.1 Define ergonomics.	Lecture and discussion.	O'Connor, A., (1993) "Physical Requirements of the Trades", Tools for Tomorrow: Women in the Trades Trainer's Guide, Madison Area Technical College, Madison, WI. Shepard, A., (1988) Renovations: Apprenticeship, Rentin Technical Vocational Institute, Rentin, WA.
PC.1.2 Explain how poor tool choice and incorrect usage of tools contribute to injury.	Lecture and discussion.	
PC.1.3 Select tools that minimize static muscle loading, pressure on joints, vibration, and pinching.	Lecture and demonstration.	Hand and power tool set.
PC.1.4 Demonstrate the correct way to use various hand and power tools.	Exercise: Practice using hand and power tools.	Hand and power tool set.
PC.1.5 Describe how cumulative trauma disorders and awkward lifting injuries occur.	Lecture and discussion.	
PC.1.6 Demonstrate the relationship between base of support and center of gravity in standing postures.	Partner Exercise: Biomechanics of Posture.	
PC.1.7 Demonstrate proper methods of manual lifting and handling.	Exercise: Practice with ladders, shifting loads, heavy weights, and large sheets.	Ladder Safety from Tradeswoman Magazine (Vol. 2, No. 1, Spring 1992), San Francisco, CA.
PC.1.8 Explain why safety equipment should be used.	Lecture, demonstration, and discussion of safety equipment.	

Madison Area Technical College
Tools for Tomorrow
Course Outline

Module: Physical Conditioning — Class hours: 3
Unit 2: Exercise Physiology

Competencies	Learning Activities	Resources
PC.2.1 Describe physical demands characteristic of various trades.	Lecture and discussion.	Shepard, A. Renovations: Apprenticeship, Rentin Technical Vocational Institute, Rentin, WA.
PC.2.2 Explain the need for physical fitness.	Lecture and discussion.	American Red Cross (for booklets on the prevention of back injuries and reference materials).
PC.2.3 Identify the main components of a complete exercise program.	Lecture and discussion.	Fahey and Hutchinson, (1992) Weight Training for Women, Mayfield Publishing Co. Mountain View, CA. Pearl, B., (1986) Getting Stronger, Shelter Publications, Bolinas, CA. Rippe and Ward, (1989), Rockport Walking Program, Prentice Hall Press, New York, NY.
PC.2.4 Demonstrate the proper use of basic weight lifting training equipment on a Universal set.	Demonstration and practice on a Universal set.	Thompson, C. W., (1989) Manual of Structural Kinesiology, C. V. Mosby Co., St. Louis, MO. Tobins, M., and Sullivan, J. P., (1992) Complete Stretching, Alfred A. Knopf, New York, NY. Universal Gym, MATC, Commercial Avenue Education Center, Room 704, 2125 Commercial Avenue, Madison, WI. Yessis, M., (1992) Kinesiology of Exercise, Masters Press, Indianapolis, IN. PC.1.2 Explain the need for physical fitness. Lecture and discussion.
PC.2.5 Demonstrate correct movements for exercises in the home conditioning program.	Demonstration and practice of home conditioning exercises.	A.C.S.M. Fitness Book, (1992) Leisure Press, Champaign, IL. Anderson, B., (1980) Stretching, Shelter Publications, Bolinas, CA. Back Exercises for a Healthy Back, (1988) Krames Communications, Daly City, CA.

Madison Area Technical College
Tools for Tomorrow
Course Outline

Module: Print Reading
Unit: Print Reading Basics

Class hours: 3

Competencies	Learning Activities	Resources
PR.1.1 Translate standard symbols and abbreviations used on blueprints of buildings and bridges.	Lecture and discussion. Group Exercise: Identification of Abbreviations and Symbols Used in Building Construction.	Bleakely, G. C. & Chilton, E. G. (1973), Engineering Design and Graphics, New York: Macmillan. "Definitions and Symbols", from Building Trades Printreading - Part 2, (1989) American Technical Publishers Company, Homewood, IL.
PR.1.2 Determine the type of section (view) depicted on a blueprint.	Lecture and discussion. Group Exercise: Section Types.	Bleakely & Chilton (ibid.).
PR.1.3 Read elevations from a blueprint.	Lecture and discussion. Group Exercise: Identification of Abbreviations, Symbols, and Elevations Used in Bridge Plans. Quiz.	Sets of house prints and bridge prints (instructor's collection). Cannestra, B., (1993) "Print Reading", Tools for Tomorrow: Women in the Trades Trainer's Guide, Madison Area Technical College, Madison, WI.

Madison Area Technical College
Tools for Tomorrow
Course Outline

Module: Safety
Unit: Introduction to Safety

Class hours: 3

Competencies	Learning Activities	Resources
S.1.1 Identify behaviors and attitudes which may interfere with a person's safety awareness.	Lecture and discussion.	
S.1.2 Identify appropriate personal protective equipment for hazards to eye, face, skin, hearing, and breathing.	Lecture and discussion using illustrations.	OSHA Occupational Safety and Health Standards, Part 1910, Subpart I - Personal Protective Equipment, 1910.132 - 1910.137; Part 1910, Subpart G - Occupational Health and Environmental Control, 1910.95, Occupational Noise Exposure.
S.1.3 Discuss OSHA and the "right to know" or Hazard Communication Rule.	Lecture and discussion.	OSHA Occupational Safety and Health Standards (ibid.).
S.1.4 Explain what an MSDS is and the information it can provide.	Lecture and handout interpretation.	MSDS Pocket Dictionary, (1987) Genium Publishing Corp., Schenectady, NY. Material Safety Data Sheet (MSDS).
S.1.5 Describe safety factors to be considered before using a piece of equipment.	Lecture and discussion.	
S.1.6 Describe safety considerations for work areas.	Lecture and discussion.	
S.1.7 Discuss how a worker's attitude and training affects personal, equipment, and shop safety.	Video and discussion.	Milwaukee Tool Company, (1985) Milwaukee Tool Safety, Milwaukee, WI.

Madison Area Technical College
Tools for Tomorrow
Course Outline

Module: Tradeswomen Panel
Unit: Tradeswomen Panel

Class hours: 3

Competencies	Learning Activities	Resources
TP.1.1 Describe the duties of one trade area presented.	Panel member presentation and discussion.	Tradeswomen panel members from five trades in areas of construction, industrial, and technology including facilitator.
TP.1.2 Describe situations and issues affecting a woman employed in a nontraditional occupation.	Panel member presentation and discussion.	Tradeswomen panel members from five trades in areas of construction, industrial, and technology including facilitator.

Madison Area Technical College
Tools for Tomorrow
Course Outline

Module: Carpentry
Unit: Basic Carpentry

Class hours: 6

Competencies	Learning Activities	Resources
C.1.1 Describe career opportunities in carpentry in terms of demand, required training and experience, and wage.	Lecture and discussion.	Madison Area Carpenters Joint Apprenticeship Committee, (1992) "Occupational Description", Madison, WI. Madison Area Technical College Apprenticeship Division, Apprenticeship Handbook, Madison, WI.
C.1.2 Describe related job opportunities (eg. cabinet maker, millwright, resilient floor layer).	Lecture and discussion.	Madison Area Carpenters Joint Apprenticeship Committee, (1992) "Summary of Procedure for Application, Qualification, and Selection of the Carpenter and Millwright Apprentices", Madison, WI.
C.1.3 Demonstrate safe use of a circular saw and band saw.	Demonstration. Role play: Safety Assertiveness	
C.1.4 Explain the following terms: partitions, studs, door header, window header, bottom plate, load-bearing, non-load bearing, top plate, cripple studs, trimmer studs, corner assemblies, and diagonal brace.	Lecture and discussion.	Lux, D. G., Ray, W. E., Blankenbaker, E. K., and Umstattd, W., (1982), World of Construction: Laboratory Manual, Westerville, OH: Glencoe/McGraw Hill. pp. 69-73.
C.1.5 Measure and lay out components for a prefabricated wall.	Demonstration. Exercise: Prefabrication of a wall section with window opening, door opening, and corner assemblies	Lux, D. G., Ray, W. E., Blankenbaker, E. K., and Umstattd, W. (ibid.).
C.1.6 Prefabricate a section of load-bearing wall which includes a window opening, a door opening, and a corner assembly.	Demonstration. Wall Exercise continues.	
C.1.7 Erect a prefabricated section of wall on a section of subfloor and add drywall.	Demonstration. Wall Exercise continues.	Carpentry equipment and lab, MATC Commercial Avenue Education Center, Room 911, 2125 Commercial Avenue, Madison, WI.

Madison Area Technical College
Tools for Tomorrow
Course Outline

Module: Civil Technology/Surveying — Class hours: 6
Unit: Surveying Basics

Competencies	Learning Activities	Resources
CT.1.1 Describe career opportunities in civil technology/surveying in terms of demand, required training and experience, and wage.	Lecture and discussion. Video.	American Society of Civil Engineers, (1986) Civil Engineering, New York, NY. Madison Area Technical College Apprenticeship Division, Apprenticeship Handbook, Madison, WI.
CT.1.2 Describe related job opportunities.		
CT.1.3 Read vernier scales.	Lecture, demonstration, and discussion. Group Exercises: Reading vernier scales.	
CT.1.4 Stake out a curve in a road given a blueprint.	Video and discussion. Group Exercise: Staking out a road curve using a transit.	Pennsylvania Society of Land Surveyors, (1986) Land Surveying, Allenton, PA. Blueprint of a road curve (instructor's collection).
CT.1.5 Stake out the perimeter of a building to be constructed given a blueprint.	Group Exercise: Staking out a building perimeter.	Blueprint of a house to be constructed (instructor's collection).

Madison Area Technical College
Tools for Tomorrow
Course Outline

Module: Electrical — Class hours: 3
Unit 1: Introduction to Electrical Work

Competencies	Learning Activities	Resources
E.1.1 Describe career opportunities and job duties of an electrician in the construction and industrial fields, and related career opportunities that could be pursued after becoming an electrician.	Lecture and discussion.	
E.1.2 Describe the requirements and goals of electrical apprenticeship programs.	Lecture and discussion.	Madison Area Electrical Joint Apprenticeship Committee, (1992) "Notice of Apprenticeship Opportunity", Madison, WI.
E.1.3 Identify common tools used by electricians.	Lecture and discussion.	Electrician's hand tools.
E.1.4 Demonstrate bending conduit to a 90° angle using a conduit bender.	Demonstration. Exercise: Conduit bending.	Conduit benders.
E.1.5 Recognize basic electrical symbols used on blueprints.	Lecture and discussion.	Blueprint.
E.1.6 Describe the functions of a switchbox.	Lecture, demonstration, and discussion.	
E.1.7 Identify the parts of a wiring system: a switchbox, lighting outlet, and power outlet.	Lecture, demonstration, and discussion.	
E.1.8 Describe the purpose of the National Electrical Code and the Wisconsin Administrative Code.	Lecture and discussion.	Chapter ILHR16 of the Wisconsin Administrative Code and a section from the National Electrical Code 1993, (1992) National Fire Protection Association, Quincy, MA.
E.1.9 Describe how to wire and control an electrical outlet.	Demonstration. Exercise: Construct wiring system.	100 amp service entrance panel with two switches, receptacle, and light in a preconstructed wall.

Madison Area Technical College
Tools for Tomorrow
Course Outline

Module: Electrical
Unit 2: Wiring Techniques

Class hours: 6

Competencies	Learning Activities	Resources
E.2.1 Use step-ladder safely.	Lecture and discussion.	Tradeswoman Magazine, (Vol.2, No.1 Spring 1992) "Ladder Safety", San Francisco, CA.
E.2.2 Operate electrical power tools safely.	Lecture and discussion.	
E.2.3 Describe the importance of communicating with the customer to establish needs.	Demonstration and practice communicating with customer.	Instructor modelling.
E.2.4 Install non-metallic cable and outlets according to a blueprint.	Demonstration and small group exercises.	Blueprint.
E.2.5 Describe several of the requirements of the National Electrical Code for electrical installation in a garage.	Lecture.	National Fire Protection Association, (1992) National Electrical Code 1993, Quincy, MA.

Madison Area Technical College
Tools for Tomorrow
Course Outline

Module: Ironwork
Unit: Ironwork Basics

Class hours: 3

Competencies	Learning Activities	Resources
I.1.1 Discuss the ironworking industry, physical aspects of the trade, union membership, and job-related occupations.	Illustrated lecture and discussion.	Hobart Brothers Company, (1988) Pocket Welding Guide, Troy, OH. Madison Area Ironworkers Joint Apprenticeship and Training Committee, (1992) "Madison Area Ironworker Apprenticeship Program", Madison, WI. Madison Area Ironworkers Joint Apprenticeship and Training Committee (ibid.), "Occupational Description". Madison Ironworkers Local 383, (1987) Ironwork Trade, Madison, WI. Newberry, W. G., (1977) Handbook for Riggers, Calgary, Alberta, Canada.
I.1.2 Perform rigging knot, bends, hitches.	Demonstration and discussion of handout. Students will practice tying knots.	International Association of Bridge, Structural, and Ornamental Ironworkers, (1990), Basic Rigging for Ironworkers, Manual III, "Basic Rigging Knots, Bends, Hitches", Washington, DC. International Association of Bridge, Structural, and Ornamental Ironworkers (ibid.), "Basic Ironworker Hand Tools".
I.1.3 Explain the international crane signals.	Video, discussion, and demonstration.	Instruction Safety of Ontario, Canada, (1986) International Crane Signals, Ontario, Toronto, Canada. Construction Safety Association of Ontario, (1981), Crane Handbook, Construction Safety Association of Ontario, Toronto, Canada. Construction Safety Association of Ontario (ibid.), Mobile Crane Manual.
I.1.5 Explain welding processes: SMAW, GTAW, GMAW, and OXY/Fuel.	Demonstration and lecture. Video - optional.	Welding equipment and lab, MATC Commercial Avenue Education Center, Room 904, 2125 Commercial Avenue, Madison, WI. International Association of Bridge, Structural, and Ornamental Ironworkers (ibid.), "Welding Processes".

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Course Outline

Module: Machine Tool — Class hours: 3
Unit 1: Basic Machining

Competencies	Learning Activities	Resources
M.1.1 Describe job and wage prospects for the machine tool industry.	Lecture, discussion, and video.	Bailis, M. Y., The Metalworking Technician: A Human Resource Dilemma, ATEA Journal, December 1991/January 1992. Van Braemer, P., and Redsten, D., (1993) Follow-up Study of 1992 Graduates, Madison Area Technical College, Madison, WI.
M.1.2 Describe three basic machines used in the machine tool industry.	Lecture and discussion.	Basic machinist's tool list. Machine tool equipment and lab, MATC, Truax Campus, Room 86, 3550 Anderson Street, Madison, WI.
M.1.3 Read a simple blueprint and understand decimal equivalents.	Lecture and discussion using diagrams.	C-clamp blueprint.
M.1.4 Make a simple part on the manual mill.	Demonstration. Exercise: Making a C-clamp	Machine tool equipment and lab, MATC, Truax Campus, Room 86, 3550 Anderson Street, Madison, WI.
M.1.5 Recognize a die and give a simple explanation of how it works.	Demonstration and discussion.	Dies.

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Course Outline

Module: Machine Tool
Unit 2: CNC Machining

Class hours: 3

Competencies	Learning Activities	Resources
M.2.1 Describe steps for writing a program for the CNC mill.	Demonstration. Exercise: Writing a CNC program.	Machine tool equipment and lab, MATC, Truax Campus, Room 86, 3550 Anderson Street, Madison, WI. PC computer. Master Cam software.
M.2.2 Describe how a CNC mill improves upon a manual mill.	Demonstration. Exercise: Machining initials and micrometer on a keychain.	Machine tool equipment and lab, MATC, Truax Campus, Room 86, 3550 Anderson Street, Madison, WI.

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Course Outline

Module: Operating Engineers — Class hours: 3
Unit: Introduction to Operating Engineers

Competencies	Learning Activities	Resources
O.1.1 Describe career opportunities available to operating engineers.	Lecture and discussion.	
O.1.2 Identify qualifications necessary for acceptance into the operating engineer apprenticeship program and the application process.	Lecture and discussion.	Operating Engineer/Joint Apprenticeship and Training Committee, Do You Want to be an Operating Engineer, Madison, WI.
O.1.3 Describe the steps involved in the apprenticeship of an operating engineer and the types of training available at the Operating Engineers training site in Coloma, Wisconsin.	Lecture and discussion.	Wisconsin Operating Engineers, "Prospective Apprenticeship Candidate Memo", Coloma, WI.
O.1.4 Identify the major components of machinery that operating engineers use: hydraulics, electrical systems, power trains, and engines.	Lecture and discussion.	Johanning, M., (1986), Fundamentals of Service - Hydraulics, Electrical Systems, Power Trains, and Engines, Deere & Co., Moline, IL.
O.1.5 Describe the importance of moving earth with skill and efficiency, and meeting specifications for depth of excavation.	Lecture and discussion.	Nichols, H. L. Jr., (1980, Third Edition) Moving the Earth, The Workbook of Excavation, North Castle Books, Greenwich, CT. Operating Engineers Training Trust, (1979) Grade Checking for Operating Engineers, Book 1, Operating Engineers Training Trust, Whittier, CA.
O.1.6 Describe the importance of safety on construction sites and how the operating engineers insure safety.	Video and discussion.	Operating Engineers Local 319, Construction - Is it Safe?, Madison, WI.

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Module: Painting & Decorating — Class hours: 3
Unit: Introduction to the Painting & Decorating Trade

Competencies	Learning Activities	Resources
PD.1.1 Identify the different facets covered by the painting and decorating trade.	Lecture, video, and discussion.	Langenstroer, L., (1993) "Introduction to the Painting and Decorating Trade", Tools for Tomorrow: Women in the Trades Trainer's Guide, Madison Area Technical College, Madison, WI. National Joint Painting and Decorating and Drywall Apprenticeship and Training Committee (1989) Reach out for Tomorrow, Washington, DC.
PD.1.2 Describe the apprenticeship process, its wage structure, and related classroom instruction.	Lecture and discussion.	
PD.1.3 Review the safety practices, in general, that must be observed by all workers in the painting and decorating trade.	Lecture and discussion.	Langenstroer, L. (ibid.).
PD.1.4 Identify some basic tools used in the trade and their purpose.	Demonstration and discussion.	Langenstroer, L. (ibid.).
PD.1.5 Mix secondary colors from primary colors.	Demonstration. Exercise: Mixing secondary colors.	
PD.1.6 Identify basic woodgraining, stippling, and glazing techniques.	Demonstration and practice.	Langenstroer, L. (ibid.).
PD.1.7 Describe the importance of proper cleaning and maintenance of tools used.	Demonstration and practice.	Langenstroer, L. (ibid.).

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Course Outline

Module: Plumbing
Unit 1: Basic Plumbing

Class hours: 3

Competencies	Learning Activities	Resources
P.1.1 Describe career opportunities in plumbing in terms of demand, required training and experience, and wage.	Lecture and discussion.	Madison Area Plumbing Joint Apprenticeship Committee, (1992) "Occupational Description", Madison, WI. Madison Area Technical College Apprenticeship Division, Apprenticeship Handbook, Madison, WI.
P.1.2 Describe related job opportunities (i.e. soil testing, designing, sales, etc.).	Lecture and discussion.	
P.1.3 Describe types of plumbing systems: water supply, drain/vent, and septic systems.	Lecture and discussion using diagrams.	
P.1.4 Identify common plumbing tools.	Demonstration of use and names of plumbing tools.	Tool kit.
P.1.5 Identify PVC connectors and elbows.	Lecture and ungraded quiz.	Demonstration kit: PVC fittings.
P.1.6 Measure, cut, and glue PVC joints using pipe and couplings.	Demonstration. Exercise: Gluing PVC components.	1½" section of PVC sct 40 to a 1½" coupling.
P.1.7 Recognize and repair common components in faucets.	Exercise: Repairing a faucet.	Kohler Company, (1983) "Kohler Faucet Stems", Kohler, WI.
P.1.8 Describe how to make simple repairs to clogged drain lines.	Lecture with diagrams (illustration of actual plumbing fixtures).	Milwaukee Water Works, (1988) "Stop the Plumbing Noise", Milwaukee, WI.

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Course Outline

Module: Plumbing
Unit 2: Septic Systems

Class hours: 3

Competencies	Learning Activities	Resources
P.2.1 Compare different types of septic systems.	Lecture, video, and discussion.	Western Wisconsin Technical College, (1989) Septic Systems: Mound System Design and Installation, LaCrosse, WI. Docken, L. (1982), The Care and Feeding of Your Septic System, Galesville, WI: Docken Plumbing.
P.2.2 Explain how a site for a septic system is chosen.	Lecture and discussion.	Soil Survey Maps (available from County Soil Services).
P.2.3 Identify the correct soil type for a septic system.	Demonstration. Exercise: Soil identification.	Wisconsin Department of Health and Social Services, (1979), Soil Tester Manual, Madison, WI: Bureau of Environmental Health.
P.2.4 Explain the basic design of a septic system.	Lecture with diagrams.	Docken, L. (1982), The Care and Feeding of Your Septic System, Galesville, WI: Docken Plumbing. Wisconsin Department of Industry, Labor and Human Relations, Drain and Vent System Design, Madison, WI. Wisconsin Department of Industry, Labor and Human Relations, Wisconsin Administrative Codes: Plumbing, Madison, WI.
P.2.5 Determine the slope of the site using a transit and a builder's level.	Lecture. Group Exercise: Calculating slope from contour lines. Exercise: Using a transit and builder's level to determine slope.	Predetermined slope site.

Madison Area Technical College
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Course Outline

Module: Sheet Metal
Unit 1: Introduction to the Sheet Metal Trade

Class hours: 1½

Competencies	Learning Activities	Resources
SM.1.1 Identify career opportunities in the sheet metal trade.	Lecture, video, and discussion.	Mechanical Contractors Association (1988) Journey Into Tomorrow: Careers in Steamfitting and Sheet Metal, Madison, WI. National Training Fund (1989) Careers in Sheet Metal, the Kamber Group, Washington, DC.
SM.1.2 Describe sheet metal apprenticeship requirements.	Lecture and discussion.	American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE), American Society of Heating, Ventilating, Air Conditioning and Refrigeration Handbook, New York, NY.
SM.1.3 Describe various areas of the sheet metal trade.	Lecture and discussion. Exhibition/demonstration of trade products.	Budzik, R. S., (1971) Sheet Metal Technology, Howard W. Sams Co. Inc., Indianapolis, IN. National Training Fund (ibid.), The Cutting Edge - A Sheet Metal Career. National Training Fund (ibid.), Sheet Metal Apprentice Workbooks 1-4. National Training Fund (ibid.), Careers in Sheet Metal. National Training Fund (ibid.), Community Area Care Center (CACC) Blueprint. National Training Fund (ibid.), (1983) Reading Plans and Specifications. SMACNA, (1976) Fibrous Glass Duct Construction Standards, Vienna, VA. SMACNA, (ibid.), Fire Damper Guide. SMACNA, (ibid.), Low Pressure Duct Construction Standards. Wisconsin Department of Industry, Labor, and Human Relations, Wisconsin Administrative Codes: Building, Heating, Ventilating, and Air Conditioning. Zinngrabe, C. J. and Schumacher, F. W., (1970) Sheet Metal Workers Pocket Manual, Washburne Trade School, Chicago, IL.
SM.1.4 Describe sheet metal apprenticeship training.	Lecture and discussion. Computer demonstration.	Auto Cad, version 10, (1989) Autodesk, Inc. Kaberlein, J. J., (1973) Shortcuts for Round Layouts, Benzinger, Bruce and Glencoe, Inc., New York, NY. Kaberlein, J. J., (ibid.), Triangulation Shortcut Layouts. Zinngrabe, C. J. and Schumacher, F. W., (ibid.), Practical Layout for the Sheet Metal Shop.

Madison Area Technical College
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Module: Sheet Metal
Unit 2: Shop Introduction

Class hours: 2½

Competencies	Learning Activities	Resources
SM.2.1 State general shop safety rules.	Lecture and discussion.	
SM.2.2 Describe sheet metal brake function and operation.	Discussion and demonstration of brake operation.	Sheet metal equipment and lab, MATC Commercial Avenue Education Center, Room 906, 2125 Commercial Avenue, Madison, WI.
SM.2.3 Describe sheet metal roller function and operation.	Discussion and demonstration of roller operation.	Sheet metal equipment and lab, MATC Commercial Avenue Education Center, Room 906, 2125 Commercial Avenue, Madison, WI.
SM.2.4 Describe function and operation of shear, spot welder, and roll former.	Discussion and demonstration of shear, spot welder, and roll former.	Sheet metal equipment and lab, MATC Commercial Avenue Education Center, Room 906, 2125 Commercial Avenue, Madison, WI.
SM.2.5 Describe function and operation of common sheet metal hand tools.	Explain and demonstrate use of snips, crimper, hand folder, pop riveter, awl, setting hammer, scribe, dividers, notchers, whitney punch, drill motor, and marking gage.	Sheet metal equipment and lab, MATC Commercial Avenue Education Center, Room 906, 2125 Commercial Avenue, Madison, WI.
SM.2.6 Describe operation and function of specialty equipment; i.e., plasma cutter, Pullmax machine, unishear, Beverly shear, and punch press.	Explain and demonstrate use of plasma cutter, Pullmax, unishear, Beverly, and punch press.	Sheet metal equipment and lab, MATC Commercial Avenue Education Center, Room 906, 2125 Commercial Avenue, Madison, WI.

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Module: Sheet Metal — Class hours: 2
Unit 3: Fitting Fabrication

Competencies	Learning Activities	Resources
SM.3.1 Use template to layout a sheet metal pattern.	Clamp template, scribe, and center punch metal blank. Mark bend lines.	Jones, R. P. Sr., Templet Development for the Pipe Trades, Delmar Publisher, Inc., Albany, NY: pp 29, 31, 32. Sheet metal equipment and lab, MATC Commercial Avenue Education Center, Room 906, 2125 Commercial Avenue, Madison, WI.
SM.3.2 Cut out a sheet metal pattern.	Cut out metal pattern with hand tools.	Sheet metal equipment and lab, MATC Commercial Avenue Education Center, Room 906, 2125 Commercial Avenue, Madison, WI.
SM.3.3 Form up a sheet metal fitting.	Operate 8' brake, finger brake, roller, and bar folder. Use hand tools. Follow bending sequence.	Sheet metal equipment and lab, MATC Commercial Avenue Education Center, Room 906, 2125 Commercial Avenue, Madison, WI.
SM.3.4 Assemble a sheet metal fitting.	Operate spot welder, pop riveter, hand drill, and vise grips. Use bench stakes.	Sheet metal equipment and lab, MATC Commercial Avenue Education Center, Room 906, 2125 Commercial Avenue, Madison, WI.

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Module: Steamfitting — Class hours: 6
Unit: Basic Steamfitting Skills

Competencies	Learning Activities	Resources
ST.1.1 Describe career opportunities in steamfitting in terms of demand, required training and experience, and wage.	Lecture and discussion.	Madison Area Steamfitters Joint Apprenticeship Committee, (1992) "Occupational Description", Madison, WI. Madison Area Technical College Apprenticeship Division, Apprenticeship Handbook, Madison, WI.
ST.1.2 Describe related job opportunities as heating ventilation, and air conditioning (HVAC) technicians in industry and government.		Wisconsin Department of Industry, Labor and Human Relations, Wisconsin Administrative Codes: Building, Heating, Ventilating, and Air Conditioning, Madison, WI. Wisconsin Department of Industry, Labor and Human Relations, (ibid.) Wisconsin Administrative Codes: Uniform Dwelling.
ST.1.3 Describe the work performed by a steamfitter.	Lecture and discussion. Tour: Equipment room at the MATC Commercial Avenue Education Center.	
ST.1.4 Measure copper pipe accurately.	Demonstration. Exercise: Measuring copper pipe.	National Joint Steamfitter-Pipefitter Apprenticeship Committee, (1977) Instruction Manual for Steamfitter-Pipefitter Journeymen and Apprentices, USA.
ST.1.5 Cut copper pipe accurately and safely.	Demonstration. Exercise: Cutting copper pipe.	National Joint Plumbing Apprenticeship & Journeyman Committee, (1968) "Make-up and Take-off", Washington, DC.
ST.1.6 Safely solder copper pipe that does not leak.	Demonstration. Exercise: Constructing an assembly for a demo box.	Franklin, T. W., Pipefitters and Pipe Welders Handbook, Glencoe Publishing, Encina, CA. Steamfitting equipment and lab, MATC Commercial Avenue Education Center, Room 959, 2125 Commercial Avenue, Madison, WI.

Competencies	Learning Activities	Resources
ST.1.7 Compute angles required for pipe assemblies located in confined spaces.	Demonstration. Group Exercise: Computing angles for pipe assemblies. Exercise: Constructing an assembly for a demo box (includes angles and sweating joints).	Steamfitting equipment and lab, MATC Commercial Avenue Education Center, Room 959, 2125 Commercial Avenue, Madison, WI.

Madison Area Technical College
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Course Outline

Module: Trowel Trades — Class hours: 6
Unit: Basic Bricklaying

Competencies	Learning Activities	Resources
TT.1.1 Identify career opportunities in bricklaying and specialty fields in terms of demand, required training, experience, wages, and application procedures for apprenticeship.	Lecture and discussion.	
TT.1.2 Identify related job opportunities in blueprint reading, drafting, and management (owning your own business).	Lecture and discussion.	
TT.1.3 Identify safety procedures related to each task.	Lecture, visuals, discussion, and review.	
TT.1.4 Describe various units of brick and where they are used.	Lecture, demonstration, and discussion.	Brick Institute of America, (1991) Bricklaying, Master the Craft and Make Your Mark, Reston, VA.
TT.1.5 Identify common bricklaying tools and equipment.	Lecture, demonstration, and discussion.	Bon Tool, (1991) Bricklaying Tools: Choosing the Right One for You, Gibsonia, PA. Masonry equipment and lab, MATC Commercial Avenue Education Center, Room 905, 2125 Commercial Avenue, Madison, WI.
TT.1.6 Identify mortars and their uses.	Lecture, demonstration, and discussion.	Masonry equipment and lab, MATC Commercial Avenue Education Center, Room 905, 2125 Commercial Avenue, Madison, WI.
TT.1.7 Identify anchoring devices and where they are used.	Lecture, demonstration, and discussion. Exercise: Mixing and re-tempering mortar.	Masonry equipment and lab, MATC Commercial Avenue Education Center, Room 905, 2125 Commercial Avenue, Madison, WI.
TT.1.8 Erect a practice wall 4' long and 2 bricks high.	Exercise: Erect a practice wall 4' long and 2 bricks high.	Masonry equipment and lab, MATC Commercial Avenue Education Center, Room 905, 2125 Commercial Avenue, Madison, WI.

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Course Outline

Module: Welding
Unit: Welding Basics

Class hours: 6

Competencies	Learning Activities	Resources
W.1.1 Describe career opportunities in welding, required training and experience, as well as per hour wage and benefits.	Lecture and discussion.	
W.1.2 Explain what welding is and identify the characteristics of a properly made weld.	Lecture and discussion.	Hobart Brothers Company, (1988) Pocket Welding Guide, Troy, OH. Jeffus & Johnson, (1984) Welding Principles and Applications, Delmar Publishers, Albany, NY.
W.1.3 Describe personal and equipment safety considerations in relation to welding.	Lecture and discussion.	Hobart Brothers Company, (ibid.).
W.1.4 Demonstrate the safe set-up and operation of a Shielded Metal Arc Welding (SMAW) machine.	Lecture and demonstration.	Hobart Brothers Company, (ibid.). Weihman, V., (1993) "Introduction to Arc Welding", Tools for Tomorrow: Women in the Trades, Madison Area Technical College, Madison, WI. Welding equipment and lab, MATC Commercial Avenue Education Center, Room 904, 2125 Commercial Avenue, Madison, WI.
W.1.5 Perform several acceptable SMAW welds.	Hands-on skill building. One-on-one instructor/ student interaction.	Hobart Brothers Company, (ibid.). Weihman, V., (ibid.). Welding equipment and lab, MATC Commercial Avenue Education Center, Room 904, 2125 Commercial Avenue, Madison, WI.
W.1.6 Compare the SMAW process to the Gas Metal Arc Welding (GMAW) process.	Lecture and discussion.	
W.1.7 Demonstrate the safe set-up and operation of a GMAW machine.	Lecture and demonstration.	Welding equipment and lab, MATC Commercial Avenue Education Center, Room 904, 2125 Commercial Avenue, Madison, WI.
W.1.8 Perform several acceptable GMAW welds.	Hands-on skill building. One-on-one instructor/ student interaction.	Welding equipment and lab, MATC, Commercial Avenue Education Center, Room 904, 2125 Commercial Avenue, Madison, WI.

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Module: Woodworking/Cabinetmaking
Unit: Introduction

Class hours: 6

Competencies	Learning Activities	Resources
WW.1.1 Understand the scope of job opportunities in woodworking and related fields.	Lecture and discussion.	Freir, J. L., (1977) Cabinetmaking and Millwork, C. A. Bennett Co., Peoria, IL.
WW.1.2 Identify hand and power tools used in class.	Demonstration. Exercise: Machine set-up.	Woodworking equipment and lab, MATC Truax Campus, Room 85, 3550 Anderson Street, Madison, WI.
WW.1.3 Demonstrate the proper use of safety devices, hand tools, and power tools.	Demonstration. Exercise: Machine set-up.	Woodworking equipment and lab, MATC Truax Campus, Room 85, 3550 Anderson Street, Madison, WI.
WW.1.4 Read and understand simple blueprints.	Exercise: Reading blueprints.	Handouts: blueprints.
WW.1.5 Be familiar with bill of materials and project layout.	Lecture and discussion. Exercise: Project layout.	Blueprints of step stool, bird feeder, tool box. Woodworking equipment and lab, MATC Truax Campus, Room 85, 3550 Anderson Street, Madison, WI.
WW.1.6 Understand the conservation of materials.	Demonstration and discussion.	Architectural Woodwork Institute, (1989) Quality Standards Manual, Architectural Woodwork Institute, Arlington, VA.
WW.1.7 Explain the different use of fasteners.	Exercise: Project assembly.	Freir, J. L., (ibid.).

TOOLS FOR TOMORROW: WOMEN IN THE TRADES

Information Update
July 1992

Congratulations!

Taemie Boley is now an electrical apprentice with H & H Electric after working as a material handler for Forward Electric. She was ranked #4 out of 168 applicants.

Candace Guzman is working as a carpenter with Venture Construction and plans to become a carpentry apprentice later this summer.

Nancy Hutson is a sheet metal preapprentice with Kilgust Mechanical.

Michelle Hahn is a laborer with Joe Daniels Construction Co.

Sarah Feldman is working as a furniture assembler/finisher with Naked Furniture.

Jeri Helgestad is framing windows at Interpane Coatings in Deerfield.

Auto Maintenance

A follow-up session on auto maintenance and repair has tentatively been scheduled for Monday, October 5, 1992 from 6-9 pm to be taught by MATC instructor Dick Virtue at Commercial Avenue. The next newsletter will confirm the date. This class is open to all participants.

Apprenticeship Application Information

Both Steamfitting and Sheet Metal Joint Apprenticeship Committees will be reranking in November, so now is a good time to apply. A 9-hour math review course is required before taking a test covering mechanical visualization, mechanical comprehension, and math. An interview is also required. Starting salary is $6.84/hour for Steamfitting and $7.45/hour for Sheet Metal plus benefits. Apply through the Mechanical Contractors Association, 1245 E. Washington Avenue, Suite 184, Madison, (608) 256-6886.

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Associated Builders and Contractors (ABC) is a non-union association with apprenticeships in carpentry, construction electrician, plumbing, pipefitting and sheet metal. An aptitude test and an interview are required. Applications should be made now in time to enroll for classroom training fall semester. Contact ABC, 4797 Hayes Road, Madison, WI, 53704, (608) 244-6056.

Tools for Change

As you know, Tools for Change is a local support group for women in the trades. Business and support group meetings are usually held on the second Friday of each month in the evening. If you have not been receiving notice of Tools for Change meetings, call Employment Options at (608) 244-5181.

MATC, 2125 COMMERCIAL AVENUE, MADISON, WI 53704, (608) 246-5285

CF067SCJ

Job Openings

Carpenters, cement masons, brickmasons and laborers.
Apply in person:
Vogel Brothers
2701 Packers Avenue
Madison, WI

Carpentry apprenticeship (3 year) for person willing to make 2 year commitment after completing apprenticeship.
Apply in person:
Joe Daniels Construction Co.
919 Applegate Road
Madison, WI

Landscape Supervisor
Kent Johnson Landscape
2010 N. Evergreen Rd.
Middleton, WI
Hourly Wage: $6.00-$8.00
Seasonal position
To apply: Call Heidi at 831-9085 to make an appointment.

Truck Driver/Yardworker
Severson Scrap Metal
Wage: $45.00/day
Heavy lifting required. Full-time, permanent position. Commercial driver's license required.
To apply: Call Glen Severson at 222-4604.

Laborers, light and heavy equipment operating apprenticeships
Timme, Inc.
Endeavor, Wisconsin
For more information or to be added to their list: Call Barron Thiessen at (608)587-2765.

New Tools Classes

The next session of Tools for Tomorrow will begin on Tuesday, September 8. The following session will begin in November. If you know someone who's interested, have her call Employment Options right away and leave her name, address and phone number. She will be notified of the next orientation.

From Mary Knight

I am pleased with the number of women from the program getting into the trades and would like to see more in apprenticeships. Please give me a call to let me know how you're doing or if you would like job-seeking assistance. You can always leave a message at 246-5285 and I'll get back to you. If you've moved, we'd like to have your new address and phone. Enjoy the rest of the summer.

TOOLS FOR TOMORROW: WOMEN IN THE TRADES

Information Update
September 1992

Auto Maintenance

A session on auto maintenance will be offered on Monday, October 5, 1992 from 6-9 pm with Dick Virtue instructing. The class will be held at MATC, 2125 Commercial Avenue, Room 706, in Building B, across the parking lot from the main building. Learn more about tune-ups, the brake system, diagnostic equipment and other areas of interest. Please call our office at 246-5285 by Saturday, October 3 if you plan on attending.

Madison-Kipp Tour

Madison-Kipp is a leading area manufacturer in aluminum and zinc custom die casting. Take the opportunity to get a first-hand view of their manufacturing process. A tour has been scheduled for Wednesday, November 18, 1992 from 6-7:30 pm. We'll meet inside the main entrance at 2824 Atwood Avenue. The parking lot is on the corner of Atwood and Waubesa. Dress is important: long pants, leather tennis shoes or workboots, long-sleeves. Safety glasses will be provided. If you plan on attending, please call our office by Monday, November 16.

Job Openings

Roofers, carpenters
Apply in person:
RC Construction
6414 Kopps Ave., Suite 202
Madison, WI
Hourly wage: $7.00-$9.00
Full-time position.
Some construction or carpentry experience.
For more information: Call Jim Ceithammer, 221-0303.

Handworker
Quarra Stone
4301 Robertson Rd.
Madison, WI 53714
Hourly Wage: $7.00-$10.00
Full-time, second shift (3:45 pm-2:30 am).
Person will be cutting stone to size.
Skill with power and hand tools, auto body or woodworking experience helpful, ability to read blueprints.
To apply: Send resume by October 10, 1992.
For more information, call the City of Madison Affirmative Action Office at 267-8786.

Construction and general laborers
Laborers Union
2025 Atwood Avenue
Madison, WI
To apply: Pick up applications in person.
Office open from 7 am-4:30 pm.
Applications can be dropped off on Thursdays between 2-4 pm to give staff a chance to ask questions regarding experience. Applications can also be dropped off at other times or mailed in and staff will call you if there are questions.

Apprenticeship Application Information

Wisconsin Operating Engineers
Route 1, Box 60
Coloma, WI 54930
(715) 228-4911

Application can be requested by phone beginning November 1st and the completed application must be received by January 31, 1993. Applicants will be selected for an interview partially based on prior experience. Participation in the Tools for Tomorrow program is considered relevant experience so show your involvement on the application. If you are selected, six weeks of pre-apprenticeship training on site in Coloma is required.
Beginning hourly wage for apprentice:
$15 plus benefits
For more information, call Don Shaw, Jr. at the number listed above.

Tools for Change

Tools for Change has several volunteer tradeswomen who are interested in being mentors for Tools for Tomorrow participants. So, if you'd like a tradeswoman to provide you with more information on your trade area along with personal advice on getting and keeping a job, please give me a call.

Congratulations!

Sarah Feldman has been indentured as a carpentry apprentice through Associated Builders and Contractors (ABC) with Joe Daniels Construction Co.

Sheryl Schrieber is working as an electrical material handler for Staff Electric.

Candace Guzman is now a carpentry apprentice with Venture Construction.

New Tools Classes

The current session of Tools for Tomorrow is underway with 14 women enrolled. Session 2 will begin November 9th and Session 3 on February 1st. If you know someone who's interested, ask her to call Employment Options at 244-5181 and leave her name, address and phone number. She will be notified of the next orientation session.

TOOLS FOR TOMORROW: WOMEN IN THE TRADES

Information Update
February 1993

Operating Engineers

A field trip to the Operating Engineers training site at Coloma has been scheduled for **Saturday, February 20**. Don Shaw Jr., Apprenticeship Coordinator, will be hosting our group. You'll have a chance to drive some heavy equipment. Dress warmly.
Meet Cheryl Primeau at MATC, 2125 Commercial Avenue, inside the front door at 8:15 am. You'll return by 3 pm. There will be volunteer drivers and you'll need to chip in for gas.
Call by Monday, February 15, to confirm. Space is limited so call soon. If you sign up, be sure to follow through.

Apprenticeship Application Deadlines

Ironworker - February 12, 1993
Contact: Madison Ironworker Joint Apprenticeship Committee
1602 S. Park Street
Madison, WI 53715
(608)256-3162
Apply in person from 8am-4:30pm.

Electrical - February 26, 1993
Contact: Madison Electrical Joint Apprenticeship Committee
1602 S. Park Street
Madison, WI 53715
Apply in person from 9am-1pm.

Operating Engineers
Route 1, Box 60
Coloma, WI 54930
(715)228-4911
If you requested an application by January 31, 1993, it must be returned by February 28, 1993.

Congratulations!

Congratulations to all of the participants from Sessions 1 and 2 who completed their training and to the following participants who obtained nontraditional employment.

Lisa Crook is an electrical material handler with Service Electric working on the Dodgeville Memorial Hospital addition.
Joan Hollibush is a sheet metal pre-apprentice with Air Temperature.
Laurie Kowing is working as a machinist at Madison-Kipp Corporation.
Laurie Mancheski is an expediter with Acker Construction, DeForest.

Mentoring

Tools for Change has several volunteer tradeswomen who are interested in being mentors for Tools for Tomorrow participants. So, if you'd like a tradeswoman to provide you with more information on a trade area along with personal advice on getting and keeping a job, please give me a call.

Job Openings

Concrete Construction Worker
Hottman Construction
Hourly Wage: Negotiable
Prefer some experience in construction. Good driving record necessary.
Apply in person at Hottman Construction, 5902 Raymond Road, Madison 53711.
For more information: Give me a call at 246-5285.

Construction and general laborer positions
Laborers Union
2025 Atwood Avenue
Madison, WI
Pick up applications in person Monday-Friday from 7 am-4:30 pm. Applications can be dropped off on Thursdays between 2-4 pm to give staff an opportunity to meet with you. Applications can also be dropped off at other times or mailed in.

Findorff, Inc. will be seeking laborers for the upcoming Dane County Jail construction project. Hiring for these positions will be through the Laborers Union and is described above. .
Findorff may also have carpentry apprenticeships available. If you're interested and have your hunting license, apply directly at Findorff's hiring office, 601 West Wilson Street, Madison.

State of Wisconsin Current Employment Opportunities Bulletin of January 25, 1993 listed the following positions under Randomly-Ranked Job Titles: Laborer ($6.48/hr), Motor Vehicle Operator 1 ($6.98/hr) and Power Plant Helper ($6.98/hr). Apply with the Application for State Employment which can be obtained at any Job Service office or by calling 266-1731. Applications must be received by February 17. No test will be given. Give me a call if you'd like the job descriptions.

Get-Together

A potluck/completion ceremony has been planned for **Thursday, April 8,** from 6-8 pm at MATC Commercial Avenue, in Rm. 903 on the first floor. Certificates will be presented to those who satisfactorily completed Tools during 1992-93, including Session 3 participants who started on February 1st.
All instructors, past participants and advisory committee members are invited to attend. Please bring a dish to pass. Soft drinks and utensils will be provided. Call 246-5285 by April 5 to let us know you'll be coming. Show your support and be there!

Retooling Strategies for the Future

This annual conference is for women interested in scientific, technical and math-related careers and is sponsored by the University of Wisconsin-Madison and Madison Area Technical College. Workshops will be offered on tackling your math anxieties, marketing your skills, starting your own business and more. There will be over 50 women representing different professions in many career areas. I'll be facilitator for the tradeswomen panel.
The conference will be held on **Saturday, March 27, 1993** from 8 am to 4 pm at the Wisconsin Center. The cost is $24 and includes lunch; some scholarships are available. Call me at 246-5285 for more information.

Mary Knight, Coordinator
Tools for Tomorrow 246-5285

TOOLS FOR TOMORROW: WOMEN IN THE TRADES

Information Update
May 1993

Improve Your Test-taking Skills

Would you like to learn more about what's covered on spatial relations and mechanical reasoning assessments? Then plan on attending this session on Wednesday, May 12, 1993, from 6-9 pm in Rm. 911 at MATC, 2125 Commercial Ave. Allie Bereny, a Tools participant with a bachelor's degree in chemistry and physics, will be instructing. If you have the workbook on Machine Mathematics, bring it with you. Please call our office at 246-5285 by Monday, May 10, if you will be attending.

FLASH--Update

Allie Bereny has just accepted a position with Muir Construction of Madison as a carpenter's assistant. Congratulations, Allie!

From Mary Knight

We had a good turnout for the pot-luck/completion ceremony on April 8th. Thanks to all who attended. The program donation from Session 3 participants was very appreciated. Please keep in touch to let me know how you're doing or if you'd like job-seeking assistance. Also, please let us know of any address or phone number changes.

Auto Maintenance

Learn more about tune-ups, the brake system, diagnostic equipment, job opportunities and other areas of interest. A session on auto maintenance will be offered on Tuesday, June 1, 1993, from 6-9 pm at MATC, 2125 Commercial Ave., Rm. 706, Building B, across the parking lot from the main building. The class will be taught by Julia Sherwood, Technical Training Instructor from Chrysler Corporation. Call our office by Thursday, May 27, if you will be attending. This session is similar in content to the class offered last October.

Apprenticeship Applications

The mechanical construction trades of plumbing, sheet metal, and steamfitting accept applications year-round. A 9-hour review course is required before taking a test covering mechanical visualization, mechanical comprehension, and math. An interview is also required. There are pre-apprenticeship positions available in sheet metal and steamfitting. If you're interested apply now by contacting the Mechanical Contractors Association, 1245 E. Washington Ave., Suite 184, Madison, WI 53703 (608) 256-6886.

Several other Joint Apprenticeship Committee accept applications year round and with seasonal hiring, now is the time to apply:

Madison Bricklayers Joint Apprenticeship Committee
1602 S. Park Street, Room 202
Madison, WI 53715
(608) 259-1151 or (608) 246-7900

Southern Wisconsin Carpentry Joint Apprenticeship Committee
1409 Emil Street
Madison, WI 53713
(608) 257-2448

Madison Cement Finishers & Plasters Joint Apprenticeship Committee
2025 Atwood Avenue
Madison, WI 53704
(608) 249-7548

Madison Painters Joint Apprenticeship Committee
1602 S. Park Street
Madison, WI 53715
(608) 256-5519

Laborers Union
Interested in working as a laborer? Pick up applications at the Laborers Union, 2025 Atwood Avenue, Madison, from 7 am-4:30 pm. Applications should be dropped off on Thursdays between 2-4 pm to give staff a chance to ask questions regarding experience. Applications can also be dropped off at other times or mailed in and staff will call you if there are questions. Contractors interested in meeting affirmative action goals sometimes contact the Laborers Union specifically for female applicants.

Job Openings
Laborer, Roadwork
Payne & Dolan
5338 Norway Grove School Rd.
DeForest, WI
846-4755
Car helpful but not required.
Apply in person to Mike Betts. Call if you need directions.

Laborers, Cement Finishing
Hottman Construction
5902 Raymond Rd., Madison, WI
271-8421
No experience necessary. Driver's license required with good record.
Call Jim Hottman to set appointment.

Roofer's Helper
A1 Restoration
2887 County Road MN, Stoughton, WI
838-6353
No experience necessary.
Contact: Dawn Malinowski

Material Handler/Truck Driver
Hill Electric
1044 S. Park St., Madison, WI
256-2983
Hourly Wage: $5.00. Raise after 30 days to $5.50
Requirements: Some knowledge of electrical equipment. Ability to lift and carry heavy electrical equipment, help pull electrical cable, dig holes and trenches. Driver's license and good driving record.
Contact: Jay Hill

Police Officer
City of Madison
Salary: $26,866/year
Minimum requirements include the following: High school diploma or high school equivalency diploma. Driver's license. Binocular vision correctable to 20/20.
The application deadline is June 1, 1993.
Applications can be obtained at the Madison Police Dept, 211 S. Carroll St., Rm. GR28 or by calling 266-4022. For questions, call George Silverwood at 266-6234.

Truck driver/cleaner
Eggiman Motors
1813 W. Beltline Hwy., Madison
Hourly wage: $6.50
Driver's license and good driving record.
Apply in person.

The following are full-time, seasonal landscape laborer positions:

Herman Landscape, 1919 Monroe, Madison
Hourly Wage: $6.00
Apply in person.

Barnes Lawn Service
Hourly Wage: $6.00. More with experience.
Call 233-8425 and request application.

Bruce Company
2830 W. Beltline Hwy., Madison
Apply in person: Todd Gill for landscape crew member positions. Billy May for landscape maintenance positions.